

**THEME THREE :  
PROTECTING OUR PLANET**

**UNIT THREE :  
ENERGY AND FUEL**





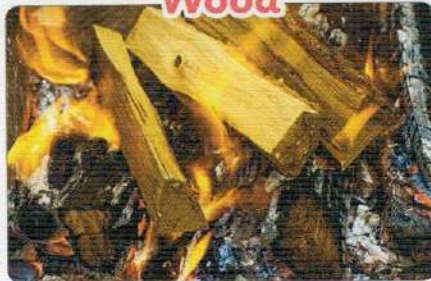
# Get Started

## What I Already Know

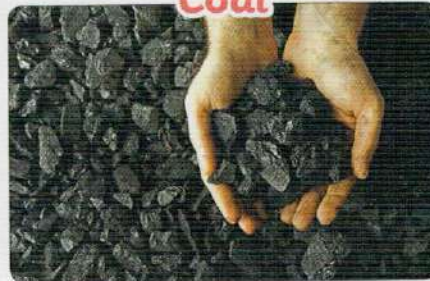


- During the first term of this year, you have learnt the meaning of energy and its relationship with work and movement.  
In this unit, we are going to learn more about energy and fuel.
- There are many forms of fuel that man uses in his daily life such as :

**Wood**



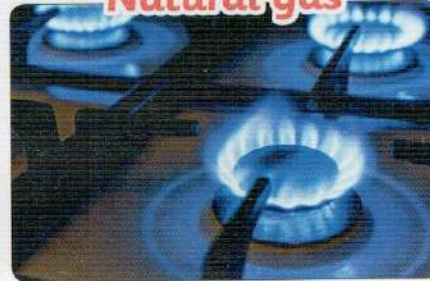
**Coal**



**Gasoline**

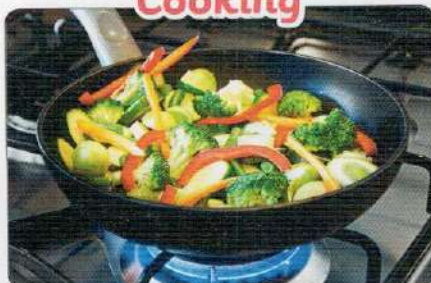


**Natural gas**



- Man uses the energy produced from burning fuel in many purposes such as :

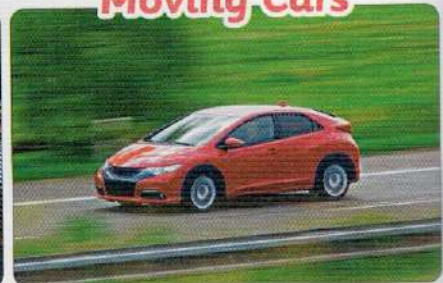
**Cooking**



**Warming**

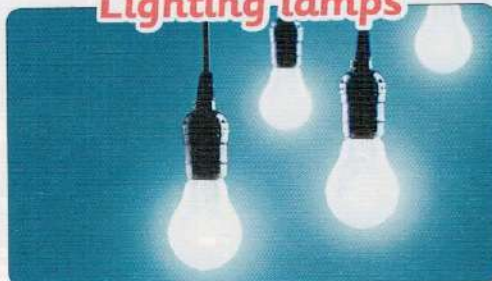


**Moving Cars**



- Also, man uses the energy produced from burning fuel in generating electricity that is used in :

**Lighting lamps**



**Operating devices**





• **In this unit we are going to study :**

- Forms and types of fuel.
- Renewable and non-renewable resources of energy.
- The impact of using some energy resources on the environment.
- How can electrical energy be generated in electric power stations ?
- The importance of using renewable resources of energy instead of non-renewable ones.
- Different uses of solar energy as a renewable resource of energy.
- Using wind and water to generate electricity.
- How can we conserve energy ?

• **Unit Project : The Effect of Building Dams :**

- At the end of this unit, you are going to do a research project about "Water" as one of the energy resources and how to use the kinetic energy in the flowing water of rivers to generate electrical energy by building dams on these rivers.
- You will also search for the effect of the construction of these dams on the surrounding environment.



Water dam

• **Interdisciplinary Project : The Bright side :**

- At the end of this unit, you are going to create a model of a "Solar cooker" that uses the solar energy in sunny regions to cook food.
- You have to use the steps of the "Engineering Design process" that you have learnt in the previous educational grades to create your solar cooker model, then you have to test it and write some ideas to improve your solar cooker model.



Solar cooker



Concept

3.1

## Devices and Energy





## Learning outcomes

**By the end of this concept, your child will be able to :**

- Develop models based on observations that describe how everyday devices transform energy.
- Use observations and evidence to explain how energy is transferred from place to place.

## Key vocabulary

- Chemical energy
- Earth
- Energy resource
- Energy conservation
- Energy transfer
- Sound
- Sun



# Can You Explain?



The pictures above show some of the devices in which energy is converted.

► **What types of energy transformations are required for sunlight to operate these devices ?**

- **Energy** can be changed from one form to another.
- Different devices can help us convert the light energy that comes from the Sun into different forms of energy.
- **Now**, most devices depend on electricity, and to generate electricity, we can convert the energy of the Sun in different ways.

► **In this concept, we will study :**

- Energy in toy cars that can be controlled remotely.
- Mars exploration rover.
- Energy chains.
- Energy and devices that we use in everyday life.
- Conservation of energy.
- Tracking of energy path.

### Notes for parents

- Discuss with your child some devices that needs electricity to be operated.



## Activity 2

# Energy in Remote-Controlled Cars

► Look at the following pictures, then answer the question :

In which picture, can the child move the car remotely ? ( ..... )



Picture (1)



Picture (2)

### Energy in remote-controlled cars

- Many toys such as cars, trucks, planes, and boats may be operated remotely.
- However, all of these toys need energy to move and perform activities like spinning in the corners and moving forward or backward remotely.



► In your opinion, how do those toys get energy ?

**Batteries** inside these toys are the resource of **chemical energy** and this energy is converted into **electrical energy** which is converted into kinetic energy or sound energy.

► But, what do we do when the batteries of these toys run out ?

Batteries can be recharged by connecting the device to a nearby charger, or by replacing the old batteries with new ones.



### Check your understanding

► Complete the following sentences using the words below :

(kinetic – chemical – electrical)

1. The energy stored in batteries is ..... energy.
2. In remote-controlled toy batteries, chemical energy is converted into ..... energy, which is converted into ..... energy or sound energy.

• Discuss with your child the importance of batteries in operating some devices.



## Activity 3

# Mars Rover

- Have you ever seen a picture of an exploration rover on Mars ?
- This rover shown in the picture below needs energy to be operated, so it can explore Mars, have you thought about how it gets the energy it requires to be operated ?

### Mars exploration rover

- Mars is about 54 million kilometers from Earth, so the spacecraft will take about six months to go that distance.
  - In the last few years, man has sent many missions to Mars, all these missions had remotely operated vehicles or robots.
  - The "**Mars rover Curiosity**" which travels on the surface of Mars, is one of the most well-known of these robots.
  - These robots, like remote-controlled toys, require energy to be operated, but the batteries used in the toys cannot be used in these robots as they are too distant from a store or charger plug on Earth.
- **So, what is the resource of energy that Curiosity exploration rover needs to be operated ?**
- The Curiosity exploration rover uses **solar panels** and **batteries** (which are charged by solar energy) as a resource of energy, where:
- The solar panels on the rover convert solar energy into electrical energy, which is used to charge the rover's batteries.
  - The electrical energy from the batteries powers the vehicle's sensors and the electrical energy is also transformed into kinetic energy and thermal energy as the vehicle moves across Mars surface.



Mars Curiosity rover



### Check your understanding

- **Complete the following sentences using the words below :**

(kinetic – electrical – solar)

- The solar panels on the Curiosity exploration rover convert ..... energy into ..... energy, which is converted into ..... and thermal energy.

### Notes for parents

- Help your child read more about Mars rover Curiosity from some online sources.

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson ① p.30
- Self-Assessment ⑦



# Lesson 2

## Activity 4

### What Do You Already Know About Devices and Energy ?

► Look at the following pictures, then answer the questions :

- This toy car needs energy to move.






- The energy needed to run this fan is electrical energy.



**Now,** let's think about how different devices get energy to be operated.

**How does energy change (transform)?**

Device	Consumed energy (input energy)	Produced energy (output energy)
 Hair dryer	Electrical energy.	Thermal energy and sound energy.
 Soap dispenser	Potential energy (stored in the spring of the soap dispenser).	Kinetic energy (the movement of the soap upward).
 Washing machine	Electrical energy.	Kinetic energy and sound energy.

- Let your child mention the input and output energies in some other devices.








### Note

When you rub your hands, you will feel warm because kinetic energy (consumed energy) is converted into thermal energy (produced energy).



### Check your understanding

► Look at the following pictures, then complete the table below :

Device	Consumed energy	Produced energy
 Remote-controlled toy car	Chemical energy.	.....
 Blender	.....	Sound energy and ..... energy.
 Television	.....	..... energy and ..... energy.

### Notes for parents

- Let your child answer the questions to check his/her understanding.



## Activity 5

# Energy Chains

- You have learnt that most of the energy we use is made inside the Sun.
- In this activity, we will discover how energy is transmitted from its resource to the devices we use.

### • Energy Chains :

- Energy chain is a way to describe or represent the energy flow that occurs when we use different devices.
- Energy chains often start with **the Sun**.
- **Now**, we will study some examples of energy chains.

### Energy chain when eating food

The Sun emits **light energy** that reaches a plant such as an orange tree.



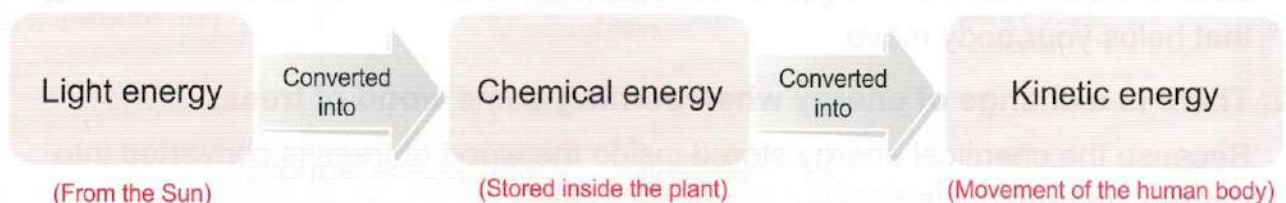
The plant converts light energy comes from the Sun into **chemical energy**, which is stored in the form of sugars inside the plant.



When you eat an orange, your body converts the chemical energy stored inside the fruit into **kinetic energy** when your body move.



► The following diagram shows the energy chain in the previous example :



- Discuss with your child the meaning of energy chains.



## Energy chain when heating a pot of water over a fire

Light energy comes from the Sun causes the growth of trees.



This light energy is converted into chemical energy which is stored in the form of sugars inside the trees.



When the wood of trees is burned, thermal energy is released which heats the water inside the pot.



► The following diagram shows the energy chain in the previous example :

Light energy

Converted into

Chemical energy

Converted into

Thermal energy

(From the Sun)

(Stored inside the trees)

(When burning the wood of trees to heat the water inside the pot)

### ? Give reasons for :

1. You eat food then go for a walk, there is a change of energy takes place inside your body.

Because the chemical energy stored in the food is converted into kinetic energy that helps your body move.

2. There is a change of energy when burning some wood of trees.

Because the chemical energy stored inside the wood of trees is converted into thermal energy.

### Notes for parents

- Discuss with your child the importance of the Sun as the main source of energy on the Earth.



## Energy chain in a hair dryer

**Light energy** from the Sun causes the growth of trees.



Coal is produced from the remains of dead trees over millions of years so, coal is a resource of energy that stores **chemical energy**.



**Coal is used in electric power stations, because :**

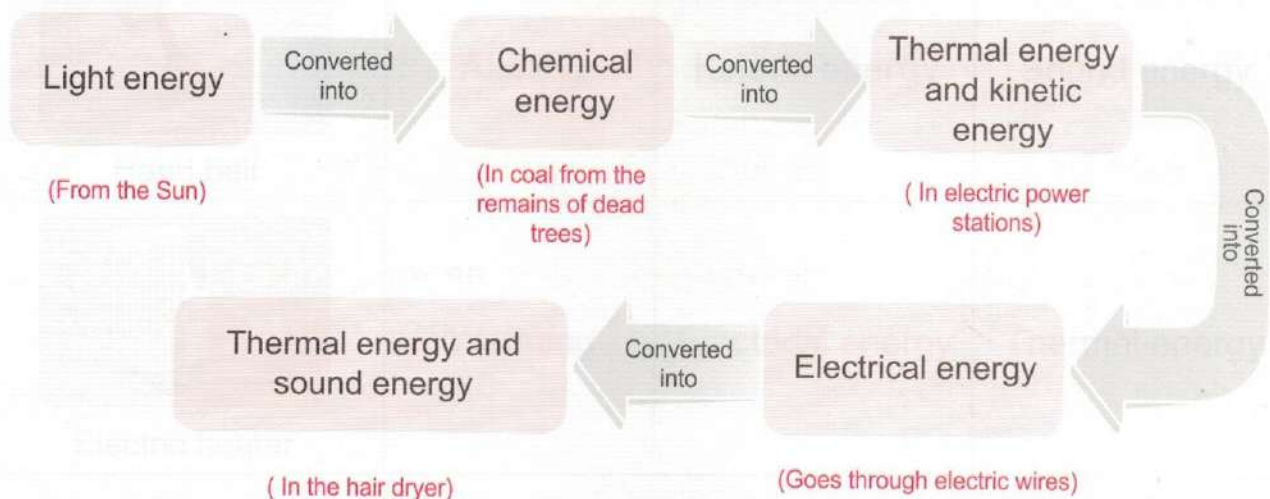
1. When coal is burnt, it produces **thermal energy**.
2. Then thermal energy is converted into **kinetic energy** which is used to operate certain devices in these stations in order to generate electrical energy.



**Electrical energy** goes through electric copper wires until it reaches the hair dryer to be operated.



► The following diagram shows the energy chain in the previous example:



• Help your child read more about electric power stations from some online sources.





## Notes

- Not all the energy in the energy chain reaches the device.
- Some of the energy is lost (escape) while travelling through the energy chain, as it is converted into other forms of energy. This is because energy is not destroyed but it is converted into other forms of energy that the device does not use.
- Most of the lost energy leaks out in the form of **heat**.



## Check your understanding

► Complete the following sentences using the words below :

(electrical – heat – chemical – coal – kinetic – Sun – thermal)

1. Most of the energy we use is produced inside the .....
2. When you eat, your body turns the ..... energy found in the food into ..... energy that helps your body move.
3. In electric power stations, ..... is burnt to generate ..... energy.
4. In an electric iron, electrical energy is converted into ..... energy.
5. In several electrical devices, most of the lost energy leaks out in the form of .....

## Notes for parents

- Let your child answer the questions to check his/her understanding.



## Activity 6

# Energy and Everyday Devices

- In this activity, you will use what you know about types of energy to describe the consumed energy and the produced energy in different devices.
- The following table shows the function, the energy consumed and the energy produced in some devices :

Device	Function	Consumed energy	Produced energy
 Electric bulb	Lighting up	Electrical energy	Light energy and thermal energy
 Battery powered clock	Showing the time	Chemical energy	Kinetic energy
 Flashlight	Lighting up	Chemical energy	Light energy and thermal energy
 Hand bell	Alerting	Kinetic energy	Sound energy
 Electric heater	Warming	Electrical energy	Thermal energy

• Let your child mention the consumed energy and the produced energy in some other devices.



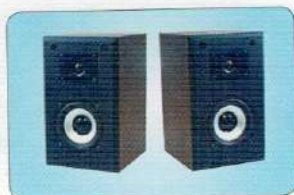


## Check your understanding

► Write the suitable device number in front of each sentence :



Device (1)



Device (2)



Device (3)



Device (4)



Device (5)

1. A device which converts electrical energy into sound energy only. (.....)
2. A device which converts electrical energy into light energy. (.....)
3. A device which converts kinetic energy into sound energy. (.....)
4. A device which converts electrical energy into kinetic energy. (.....)
5. A device which converts electrical energy into thermal energy only. (.....)

### In the Exercises Book :

Try to answer :

- Exercises on Lesson (2) p. 33
- Self-Assessment (8)

### Notes for parents

- Let your child answer the questions to check his/her understanding.



# Lesson 3

## Activity 7

# The Conservation of Energy

► Look at the following pictures, then answer the questions :

- In the kettle, electrical energy is converted into thermal energy.

Yes

No



- In the guitar, sound energy is converted into kinetic energy.

Yes

No



- In the previous lesson, we have learnt that energy can be transformed from one form to another.
- **Now**, let's study some examples of energy transformation.

### Energy chain while riding a bike

When you eat, the **chemical energy** stored in the food provides your body with energy.



When you ride your bike and push the pedals, this chemical energy is converted into **kinetic energy**, which causes the bike to move.



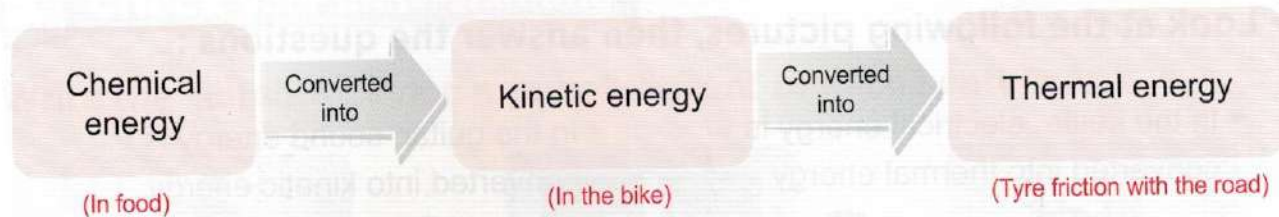
Some of the kinetic energy, is converted into **thermal energy** due to the tyre friction with the road.



- Discuss with your child the energy transformation while riding a bike.



- The following diagram shows the energy chain of the previous example :



### Energy chain when a light bulb is switched on

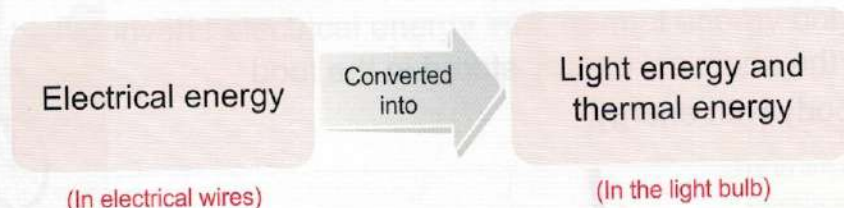
When you turn on a light bulb, the **electrical energy** that goes through the electrical wires is converted into **light energy** once it reaches the bulb.



If you put your hand near the light bulb, you can feel heat comes out of the light bulb because some of the electrical energy is also converted into **thermal energy**.



- The following diagram shows the energy chain of the previous example :



- From the previous examples, we can conclude that :

Energy can be changed from one form into another, where the new energy cannot be created from nothing, and the old energy does not disappear but it changes from one form of energy into another, this is called "**the law of conservation of energy**"

### The law of conservation of energy :

Energy can neither be created nor destroyed, but only converted from one form of energy into another.

### Notes for parents

- Discuss with your child the meaning of the law of conservation of energy.





## Check your understanding

### ► Put (✓) or (✗) :

1. When you ride a bike, some of the kinetic energy is converted into thermal energy due to the tyre friction with the road. ( )
2. Electrical energy is converted into light energy and sound energy when a light bulb is switched on. ( )
3. The food we eat contains chemical energy. ( )
4. The electrical energy that enters a fan is not destroyed, but it is converted into thermal energy. ( )

### In the Exercises Book :

#### Try to answer :

- Exercises on Lesson ③ p. 37
- Self-Assessment ⑨

• Let your child answer the questions to check his/her understanding.



# Lesson 4

## Activity 8 Follow The Flow

► Look at the following picture, then answer the questions :



1. Is all of the energy that enters the mobile phone converted into light energy ?

Yes

No

2. Does some of the energy in the mobile phone (cell phone) come out as sound energy ?

Yes

No

- According to the law of conservation of energy, we know that energy is conserved and is neither created nor destroyed.
- All the energy that enters a device must finally come out of it, either in the same form or in other forms.
- All devices have energy coming in and out of them, where :
  - The energy that comes in a device is called "input energy".
  - The energy that comes out a device is called "output energy".
- In this lesson, we will learn how the energy used to run a device is converted into other forms of energy, and where it flows.

### Energy path tracking



- When we track the path of energy of any device, it looks like the device is losing energy, but the energy is actually being converted into another form, and some of the converted energy is not helping the device do its main function.

### Notes for parents

- Help your child track the path of energy in some devices.



- The table below shows examples of input energy and output energy in some devices :

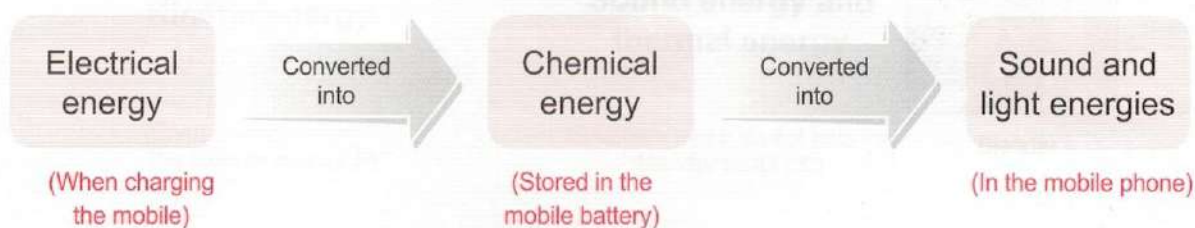
Device	Its function	Input energy	Output energy
 Hair dryer	Drying hair.	<b>Electrical energy</b> (In electric wires).	<ul style="list-style-type: none"> <li>• <b>Thermal energy</b> (Heat produced from the hair dryer).</li> <li>• <b>Sound energy</b> (Sound produced from the hair dryer).</li> <li>• <b>Kinetic energy</b> (Fan movement and airflow inside the hair dryer).</li> </ul>
 Mobile phone	Ringing, illuminating, and processing information.	<b>Electrical energy</b> (When charging the mobile phone and this electrical energy is stored inside the battery as chemical energy).	<ul style="list-style-type: none"> <li>• <b>Light energy</b> (Light produced from the mobile phone).</li> <li>• <b>Sound energy</b> (Sound produced from the mobile phone).</li> </ul>

- The following diagrams show the energy flow chains of the previous examples :

#### Energy chain in the hair dryer



#### Energy chain in the mobile phone



- Discuss with your child the meaning of wasted energy in some energy chains.





## Notes

- Noise from a hair dryer is considered as “wasted energy” because sound energy does not help the device do its main function.
- When using a mobile phone for a long time, some energy is wasted as **thermal energy** that does not help the device do its main functions.



## Check your understanding

### ► Put (✓) or (✗) :

1. Some of the output energy does not always help the device do the function for which it was designed. ( )
2. The input energy in the hair dryer is chemical energy. ( )
3. The output thermal energy from a hair dryer is considered wasted energy because it does not help the device do its main function. ( )
4. The mobile phone stores electrical energy in its battery in the form of chemical energy. ( )

## Notes for parents

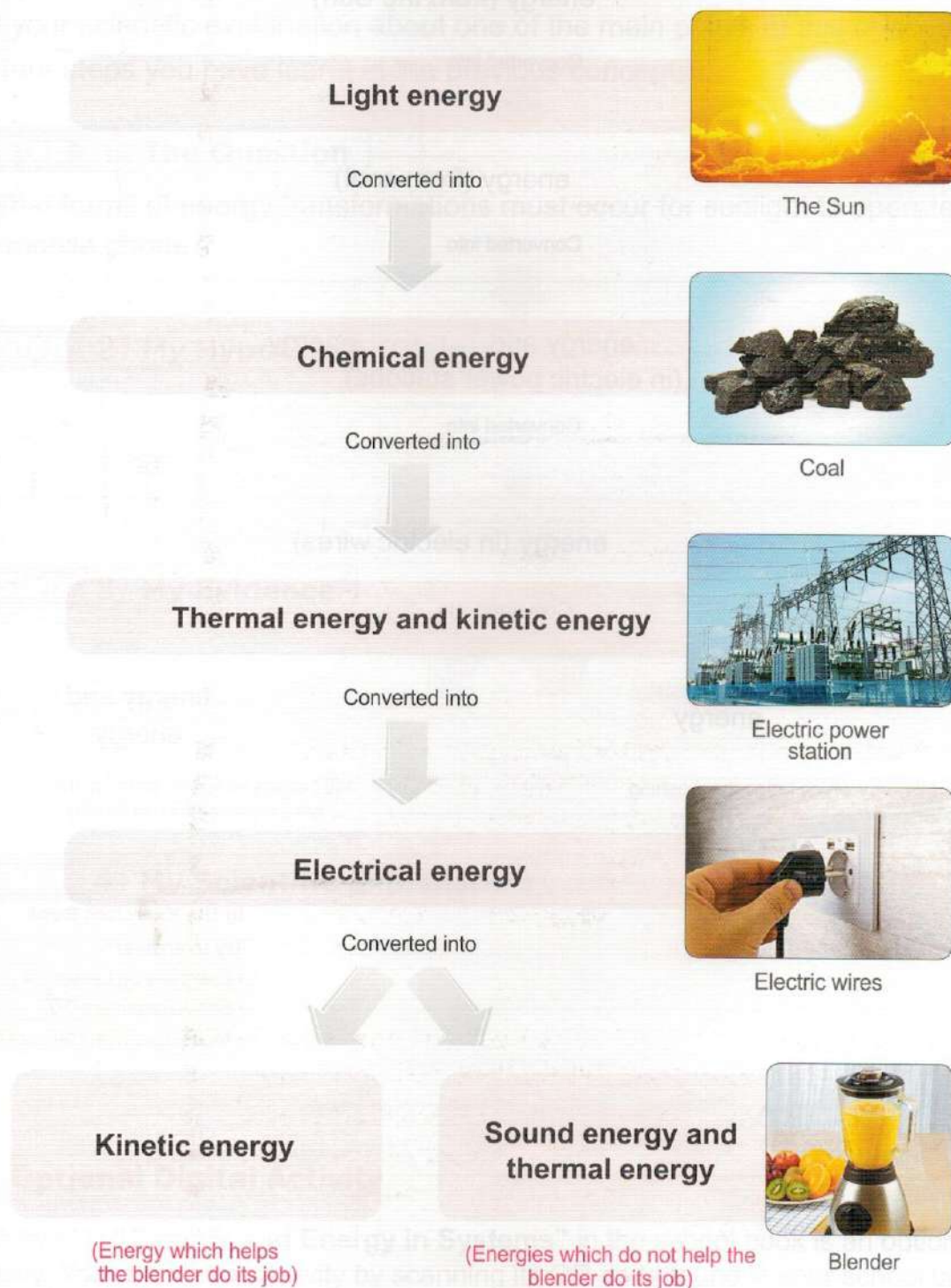
- Let your child answer the questions to check his/her understanding.



## Activity 9

# Build an Energy Chain

- In the previous lessons, you have learnt some examples of energy chains.
- **Now**, we will build an energy chain that shows the flow of energy starting with input energy and ending with output energy.



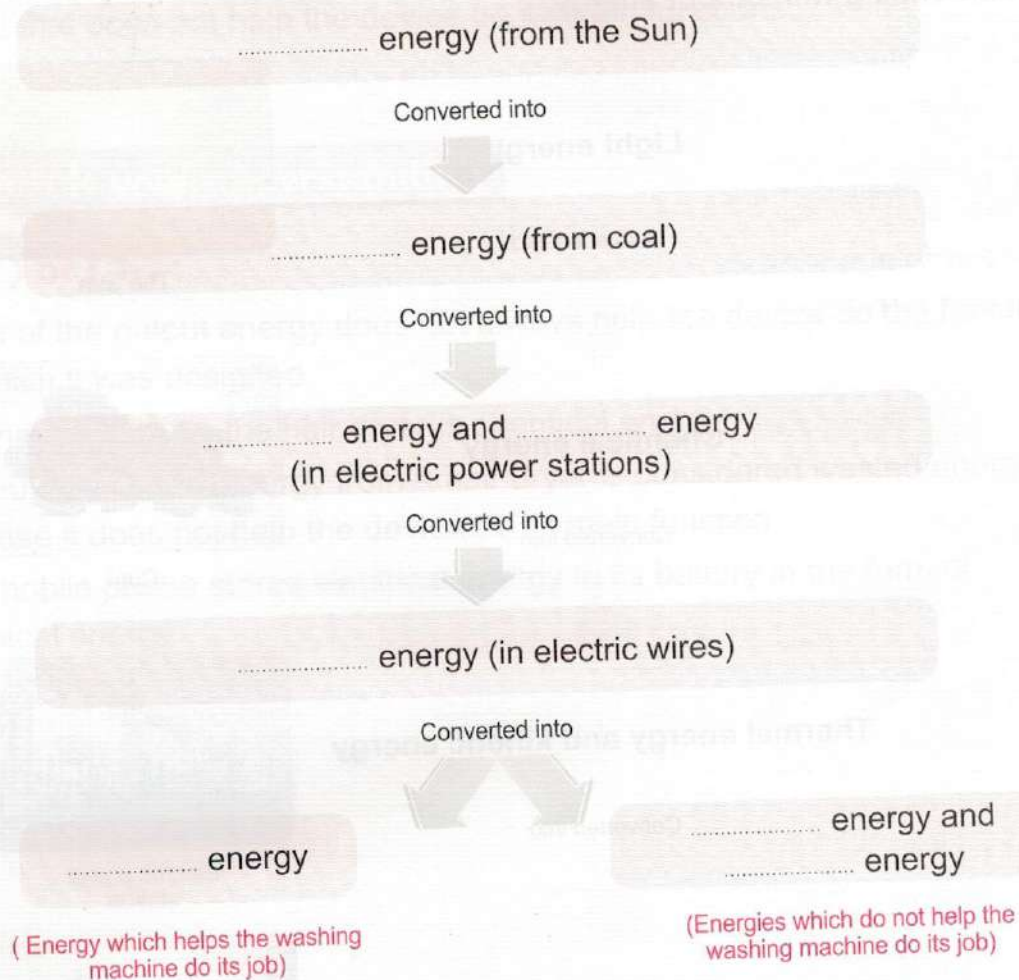
- Let your child form an energy chain to one of home electric devices.





## Check your understanding

► Complete the following energy chain in a washing machine :



### In the Exercises Book :

Try to answer :

- Exercises on Lesson (4) p. 39
- Self-Assessment (10)
- Model Exam on Concept (3.1)

### Notes for parents

- Let your child answer the questions to check his/her understanding.



## Record Evidence Like A Scientist

- In this concept, you have learnt a lot about energy and how different devices get the energy that they need to be operated.
- **Now**, try to think like a scientist by writing your hypothesis (claim), your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learnt in the previous concepts.



### Step 1 The Question

What forms of energy transformations must occur for sunlight to operate a mobile phone ?



### Step 2 My Hypothesis (Claim)

---



---



### Step 3 My Evidence

---



---



---



### Step 4 My Scientific Explanation

---



---



---



### Optional Digital Activity

Activity (11) “Careers and Energy in Systems” in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

- Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her hypothesis, evidence and scientific explanation.



## Activity 12

# Review : Devices and Energy

► We can summarize this concept in the following main points :

- Batteries inside the remote-controlled toys are the source of chemical energy, as this energy is converted into electrical energy, which is converted into kinetic energy or sound energy.
- When the batteries run out of charge, they can be recharged by connecting the device to a nearby charger or by replacing the old batteries with new ones.

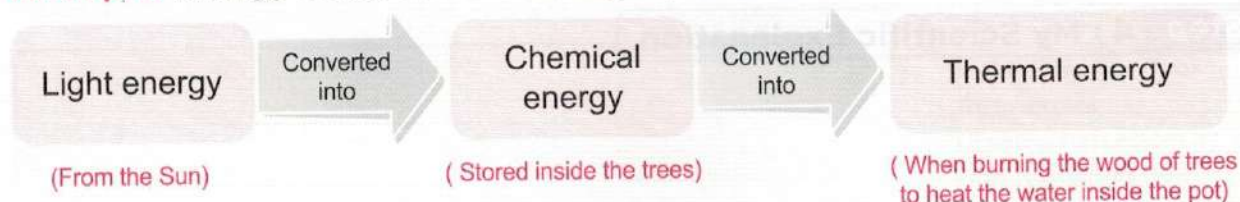
- **Mars Curiosity rover** uses solar panels and batteries (which are charged by solar energy) as a source of energy, where:
  - The solar panels on the rover convert solar energy into electrical energy, which is used to charge the rover's batteries.
  - The electrical energy from the batteries powers the vehicle's sensors and the electrical energy is also transformed into kinetic energy and thermal energy as the vehicle moves across Mars' surface.

• The table below shows the energy used and energy produced in some devices.

Device	Used energy	Produced energy
Washing machine	Electrical energy	Kinetic energy and sound energy
Electric heater	Electrical energy	Thermal energy

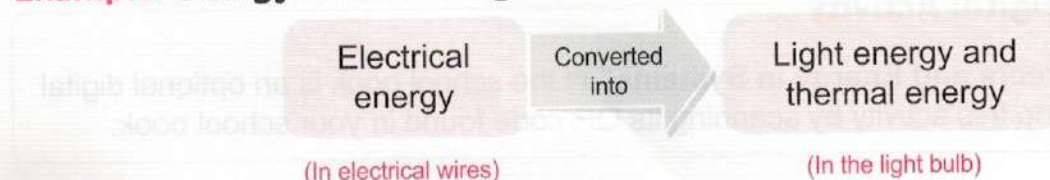
- Most of the energy we use is produced inside the Sun.
- **Energy chain** is a way to describe or represent the energy flow that occurs when we use different devices.
- Energy chains often start with **the Sun**.

**Example: Energy chain when heating a pot of water over a fire.**



- Some of the energy is lost in different forms, while travelling through the energy chain, where most of the lost energy leaks out in the form of heat.

**Example: Energy chain in a light bulb.**



## Notes for parents

- Help your child review the main points in this concept.

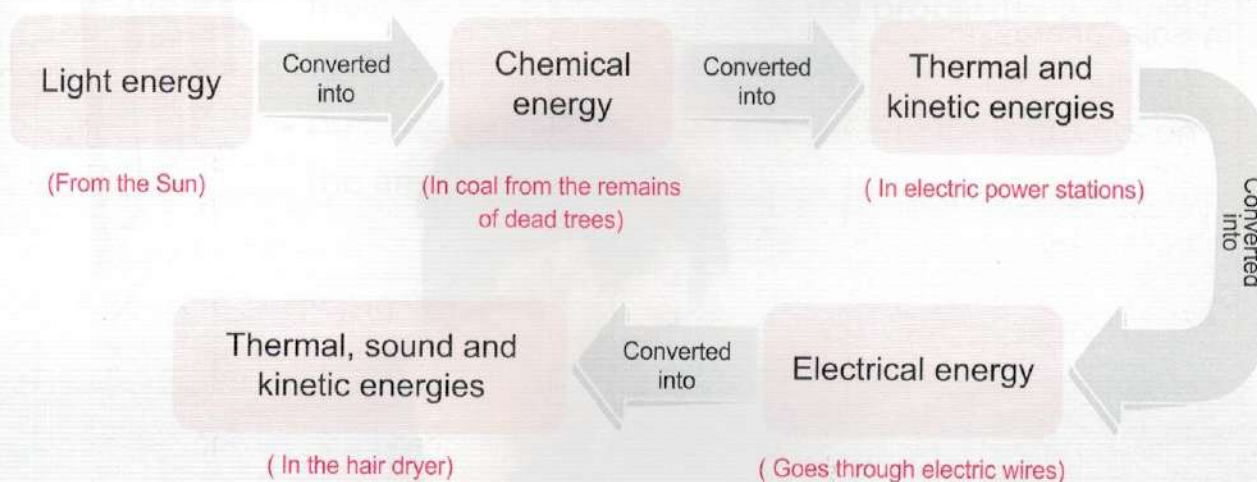


### The law of conservation of energy :

Energy can neither be created nor destroyed, but only converted from one form of energy into another.

- All the energy that enters a device must finally come out of it, either in the same form or in other forms. All devices have energy coming in them (called input energy) and coming out of them (called output energy).

#### Example: Energy chain in the hair dryer.



- When we track the energy flow of any device, we notice that sometimes the converted energy does not help the device do the function for which it was designed, such as the sound energy produced by the hair dryer in the previous example.




Concept

3.2

## About Fuel







## Learning outcomes

**By the end of this concept, your child will be able to :**

- Describe the patterns in how different types of fossil fuels are formed and predict the properties and uses of different types of fossil fuels.
- Describe how the use of energy and fuels affects on the environment.

## Key vocabulary

- Energy efficiency
- Fossil fuels
- Fuels
- Renewable energy resources
- Pollution
- Non-renewable
- Renewable
- Generate



# Can You Explain?



Gasoline (oil)



Coal



Natural gas

- In the previous concept, you have learnt what energy chains are, how energy is transformed from one form to another and that the Sun is the main source of that energy.
- **Fuel** is one of the most important resources of energy that humans depend on to get energy, **so where does the fuel we use every day come from ?**

### Fuel :

It is any substance that produces thermal energy when it is burned.

- From the previous explanation, we found that the main source of thermal energy that is produced by fuel, is the **Sun**.
- **The pictures above show several forms of fuels that we use in our daily lives, where :**  
**Oil, coal and natural gas** are considered from forms of fuels that are extracted from the underground and they are the most commonly used fuels in our lives as they are used in warming, running transportation and generating electricity.
- **In this concept, we will study :**
  - Types of fuel.
  - Fossil fuel formation.
  - Conserving fossil fuels.
  - Oil and water.
  - Using fossil fuels to generate electricity.

### Notes for parents

- Discuss with your child that any fuel must produce thermal energy when it is burned.



## Activity 2

# Fuels and Road Trips

1. Can cars move on roads when they run out of fuel ?

Yes

No

2. Do cars need fuel to get energy to move ?

Yes

No



- There must be fuel in the car to move again after it stops, where the fuel burns inside the car engine producing thermal energy that is converted into kinetic energy which causes the car to move.

### ► Read this story to learn why fuel is so important on road trips.

- One morning, Hany's family woke up and decided to travel to Alexandria to visit aunt Nora, who lives there. Hany, his mother and sister Samar got into the car.
- While driving down the highway, Samar noticed that the gasoline pointer was close to zero and she said to her mother that the fuel was running out and she needed to stop at the nearest fuel station (gas station).
- Hany's mother drove to the nearest fuel station, where a station worker filled the tank and then she drove the car again.
- Hany asked his mother, "Why does a car need fuel to move?" She said the car needs fuel to move, so that the fuel burns inside the car engine, allowing the engine to rotate the wheels, so without the fuel, the car will not move.



### Check your understanding

#### ► Put (✓) or (✗) :

1. Cars need a source of energy to move. ( )
2. The fuel burns inside the car engine, allowing the engine to rotate the wheels. ( )

• Discuss with your child the importance of fuel in providing different means of transportation with energy to move.



## Activity 3

# What Do You Already Know About Fuels ?

- From the previous activities you have learnt that fuel is any substance produces thermal energy when it is burned. Among the several forms of fuel are :



Gasoline (oil)



Natural gas



Wood



Coal

- **Now**, we will learn more about different forms of fuel and their uses.

### Uses of some different forms of fuel

Fuel is used for several purposes, such as :

1

Cooking food, where coal, natural gas or wood may be used.



2

Generating electricity, where oil, natural gas or coal may be used.



3

Warming, where coal or wood may be used.



4

Operating all means of transportation, where gasoline (oil) or natural gas may be used.



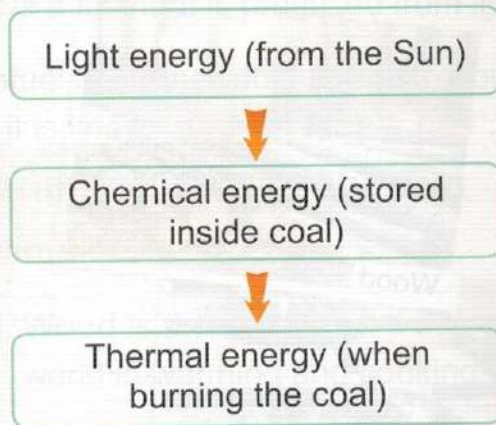
### Notes for parents

- Let your child mention some other uses of fuels in our daily life.

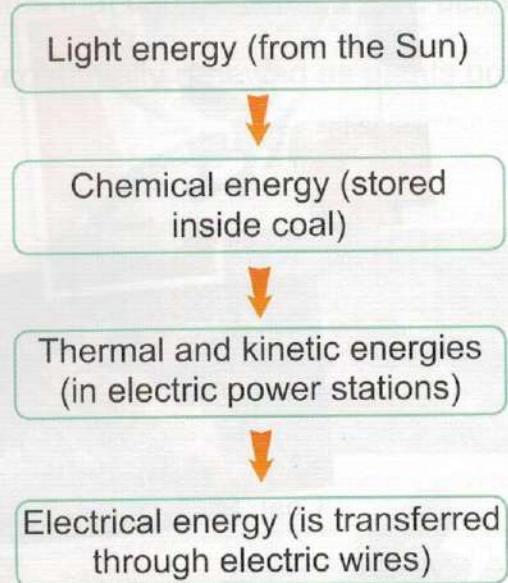


- The thermal energy produced from the same form of fuel can be used for different purposes, as shown in the following two energy chains :

• The use of coal in cooking :



• The use of coal in generating electricity :



**Note**

Gasoline is a fuel that is made from oil.



**Check your understanding**

- Complete the following sentences using these words :

(coal – thermal – gasoline – natural gas)

1. Fuel is used as a source of ..... energy.
2. Burning of ..... or ..... allows cars to move.
3. Natural gas and ..... are used as resources of thermal energy for cooking food.

**In the Exercises Book :**

Try to answer :

- Exercises on Lesson (1) p. 42
- Self-Assessment (11)

- Let your child answer the questions to check his/her understanding.



# Lesson 2

## Activity 4

## Types of Fuel

- The following pictures show several forms of fuel. Complete the following sentences using the words below pictures (you may use one word more than one time).



Gasoline (oil)



Wood



Coal



Natural gas

1. From forms of fuel that are used in cooking food are ..... or .....
2. From forms of fuel that are used in generating electricity are ..... , ..... or .....
3. From forms of fuel that are used in operating all means of transportation are ..... or .....

- In the previous lesson, you have learnt that fuel is one of the most important resources of energy and these resources are divided into:

① Renewable energy resources	② Non-renewable energy resources
<ul style="list-style-type: none"> <li>• They are natural resources that can be replaced after a short period of time of use, such as <b>water</b>, <b>solar energy</b> and <b>wind energy</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• They are natural resources that are used at a rate faster than they can be replaced, such as <b>coal</b>, <b>natural gas</b> and <b>oil</b>.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Renewable energy resources</b> are those that continually renew or replace the part that has been consumed (used), so they will not run out.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Non-renewable energy resources</b> are those that run out when consumed (used) and cannot be renewed in a short period of time.</li> </ul>

### Notes for parents

- Discuss with your child the difference and examples of renewable and non-renewable energy resources.



► Types of fuel can be classified into:

1 Biofuel

2 Fossil fuel

1 Biofuel

**Biofuel :**

It is a fuel that is produced from living organisms that can be planted (i.e., plants).

► Biofuel is a renewable energy resource that is continually renewed as plants grow, so it is known as "**renewable fuel**".

**its primary source : The Sun**

**Examples :**

1. **Wood** is the oldest fuel that is still used all around the world in warming and cooking food.



2. **Charcoal** is made from wood and it is one of the most important forms of fuel.



3. **Some types of plants such as grass, corn and wood chips** can be used to make a liquid fuel.



**conservation of biofuel :**

Although biofuel is a renewable energy resource, it should be conserved (rationalized) , where :

Using wood as a source of energy requires cutting down trees.

Rapid cutting down trees (known as "deforestation"), causes negative effects on the environment.

Therefore, the wood we use should be continuously rationalized, so that it will not run out.

**Note**

Many trees grow a few centimeters each year, while some trees reach their full height in a period nearly equals the human's lifetime. This means that the growth of these trees takes more than one human's lifetime to complete their growth.

• Discuss with your child the meaning of biofuels and how to conserve them.



## 2 Fossil fuel

### Fossil fuel :

It is a fuel that is produced from old living organisms (plants or animals) that were buried and decomposed over a long period of time.

- Fossil fuel is a non-renewable energy resource, because once it is consumed, it runs out faster than it can be renewed.

### Its primary source : The Sun

#### Examples :

1. **Oil and natural gas** are formed when the remains of marine organisms (sea animals) were decomposed.



2. **Coal** is formed when the remains of plants were decomposed.

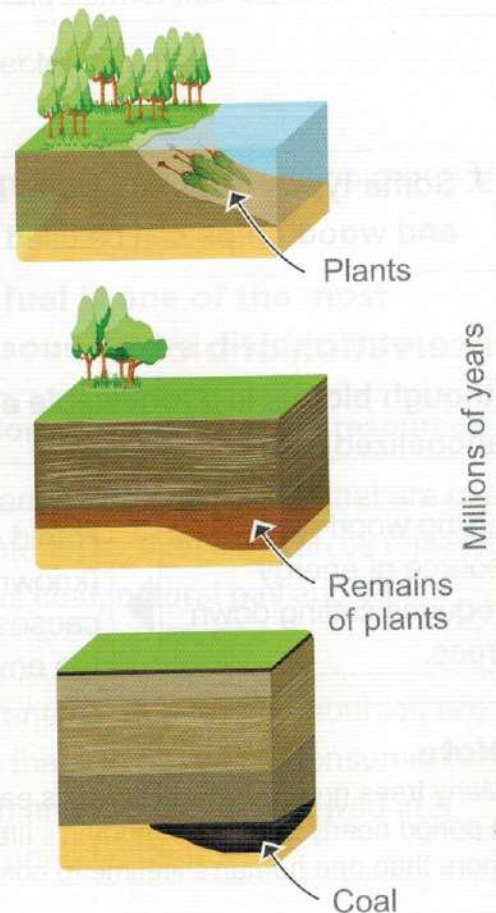


### Formation of coal :

300 million years ago, large areas of the Earth were covered with swamps, with a lot of plants growing nearby.

When those plants died, their remains were decomposed and covered by hundreds of metres of mud and rocks.

Due to the effect of extreme heat and pressure, those remains were turned into **coal**.



### Notes for parents

- Discuss with your child the meaning of fossil fuels and their formation.



## Conservation of fossil fuel :

► **Non-renewable fossil fuels should be conserved and alternative resources should be found as :**

- Fossil fuels (coal, oil and natural gas) take millions of years to be formed, as they are consumed faster than they are formed. Once they are used, they start to run out because they can't be easily renewed.



### Check your understanding

► **Complete the following table using these words :**

(living organisms – grass – renewable – oil – corn  
– non-renewable – the Sun – millions of years – coal )

Points of comparison	Biofuel	Fossil fuel
Definition :	It is a type of fuel that is formed from ..... that can be planted.	It is a type of fuel that is formed from the remains of living organisms, where it takes ..... to be formed under certain conditions.
Primary source :	.....	The Sun.
Renewable or non-renewable :	.....	.....
Examples :	Wood, ..... and .....	Natural gas, ..... and .....



### Optional Digital Activity

Activity (5) "**Fossil fuels**" in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

- Discuss with your child how to conserve fossil fuels.



## Activity 6

# Oil and Water

- Oil and water are considered from resources that are used by humans to generate energy.
- Oil has a structure differs from that of water.
- Oil is a non-renewable energy resource, while water is a renewable energy resource.

### Formation of oil :

- Oil is extracted from the underground as a result of decomposition of marine organisms, where :

When those marine organisms died, their remains settle on the ocean floor.



Over millions of years, layers of sediments and rocks cover the remains of those marine organisms, this results in extreme heat and pressure.



Over time, as a result of extreme heat and pressure, those remains converted into **oil**.

### Conservation of oil :

- ▶ **Oil is consumed at a rate greater and faster than the production of new oil, so it should be rationalized in order to avoid running out through many ways such as :**

1. Reducing the use of private vehicles.
2. Using of public means of transportation.



### Conservation of water :

- ▶ **People should use water carefully and rationalize its using through many ways such as :**

1. Avoid wasting or polluting water, because we may not be able to replace it as quickly as we need.
2. Growing plants that do not need large amounts of water for irrigation.



### Notes for parents

- Discuss with your child how oil is formed and how to conserve it.





## Check your understanding

### ► Complete the following sentences :

1. Over time, the remains of marine organisms are converted into ..... as a result of extreme heat and .....
2. Oil is a ..... energy resource, while water is a ..... energy resource.
3. Using of ..... and reducing the use of ..... are from ways that conserve oil.
4. Oil is extracted from ..... as a result of decomposition of .....

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson ② p. 45
- Self-Assessment ⑫



• Let your child answer the questions to check his/her understanding.



# Lesson 3

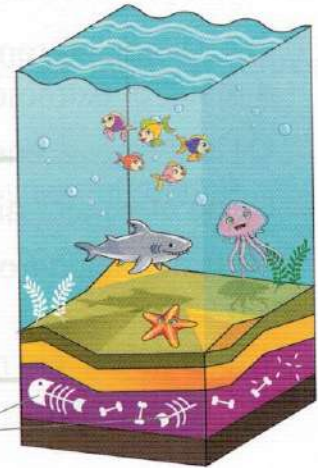
## Activity 7

### Fossil Fuel Formation

- Arrange the following steps to know how the fossil fuel is formed :

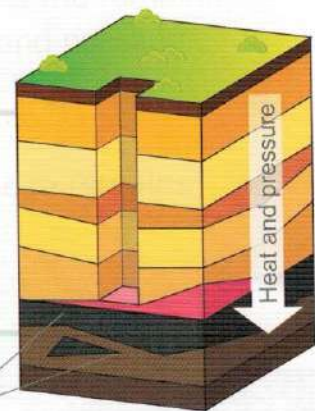
The remains of marine living organisms were buried and decomposed under sediments and rocks.

Remains of marine living organisms



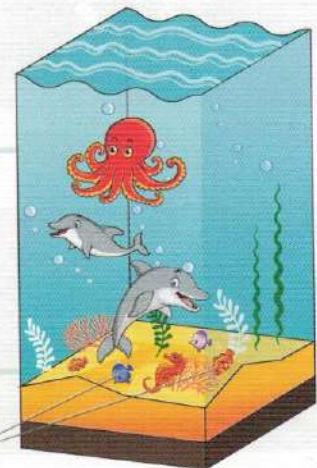
Due to the effect of extreme heat and pressure, the remains of marine living organisms were turned into **oil** or **natural gas**.

Oil or natural gas



The death of marine living organisms that have lived since ancient times.

Dead marine living organisms



#### Notes for parents

- Let your child arrange the steps of fossil fuel formation.



## Activity 8

# Living Without Electricity

- ▶ From the previous lessons, you have learnt that fossil fuels are non-renewable energy resources which are used to generate electrical energy, where, natural gas and oil are used to generate electricity in many regions, so they should be conserved.
- ▶ Renewable energy resources such as **hydroelectric energy** (from waterfalls and dams) and **wind energy** are also used to generate electricity.
- ▶ Whatever the resource of energy is renewable or non-renewable, we should conserve the energy through many ways such as :

1 Turning off lights when they are not needed.



2 Unplugging electrical appliances when not in use.



- Imagine the electric current being cut off while you were studying, you can use simple ways to keep studying, like :

1. Using candles instead of the electric lamps.
2. Writing with a pen and paper instead of using a computer.

- From the above example, we conclude that **electrical energy** is very important in our lives and should be conserved.



## Check your understanding

- ▶ Look at the following pictures and then put (✓) in front of the picture showing how to conserve electricity.



- Discuss with your child how to conserve the using of electricity.



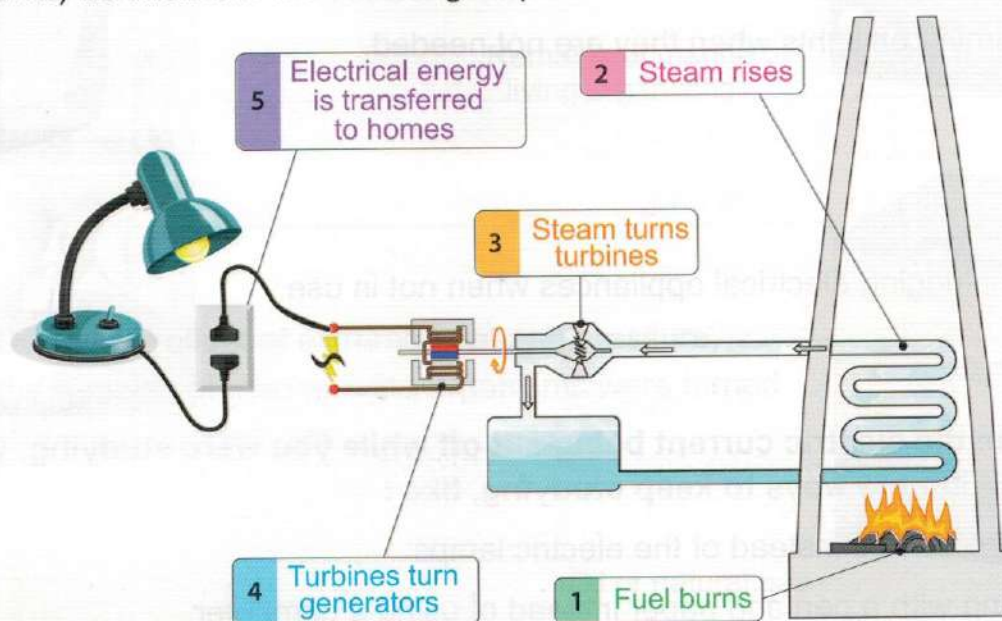
## Activity 9

# Using Fossil Fuels to Generate Electricity

- As you knew from the previous lessons that fossil fuels have many uses including :
  1. The use of gasoline and natural gas to operate cars.
  2. The use of oil, coal and natural gas to generate electricity.
- **Now**, we will study how fossil fuel can be used to generate electricity, which is used to light homes.

### How fossil fuel is used to produce electricity

To generate electricity, fossil fuel is burned at the electric power stations (power plants) as shown in the following steps :



#### 1 Fuel burns

When fuel burns, it produces thermal energy.

#### 2 Steam rises

This thermal energy is used to heat water producing steam.

#### 3 Steam turns turbines

The steam goes inside tubes to be used to operate devices called "turbines".

### Notes for parents

- Help your child read more about generating electricity in electric power stations from some online sources.



#### 4 Turbines turn generators

- The movement of turbines produces kinetic energy, which is used to operate the generator.
- When the generator is turned on, it converts the **kinetic energy** into **electrical energy**.

#### 5 Electrical energy is transferred to homes

Finally, the electrical energy is transferred through cables (wires) to homes to operate different devices.



#### Check your understanding

##### ► Complete the following sentences :

1. When fossil fuel burns, it produces ..... energy.
2. In the electric power stations, the thermal energy that is produced from burning fossil fuel is used to heat water to form .....
3. In the electric power stations, there is a device known as ..... that is used to convert the kinetic energy into electrical energy.

##### In the Exercises Book :

Try to answer :

- Exercises on Lesson ③ p. 49
- Self-Assessment ⑬

• Let your child answer the questions to check his/her understanding.



# Lesson 4

## Activity 10

### Big City Environmental Concerns

► Put (✓) in front of the picture that shows environmental pollution :



- From the previous lessons, you have learnt that fossil fuels have negative effects on the environment.
- In this lesson, we will study that fossil fuels have many bad effects in big cities, where the increase of people's needs and their industrial and agricultural activities cause pollution problems around the world.

#### Some sources of pollution in big cities

- 1 Burning fuel produces smog, which pollutes the air.



- 2 Pesticides used on farms are mixed with water in canals and rivers when rain falls, this lead to pollution of soil and water.



- 3 Using chemicals in factories pollute the air and also the nearby water sources and soil.



#### Some effects (impacts) of air pollution on human's health

1. Smog from cars cause irritation of human's eyes and lungs.



2. Scientists have found that smog contains tiny particles that the human breathes in, these particles irritate the lungs, causing the damage of tissues of the respiratory system.

#### Notes for parents

- Discuss with your child the sources of air pollution that causes many harmful effects on human's health.



## Note

Countries should make a greater effort to set laws to prevent high levels of smog in big cities.



## Check your understanding

### ► Complete the following sentences :

1. Smog from cars cause irritation of human's ..... and .....
2. When ..... used on farms are mixed with water in canals and rivers when rain falls, this lead to pollution of soil and water.
3. Burning fuel produces ....., which pollutes the .....

IS



ve

es,  
vities



athes in,  
iratory

• Let your child answer the questions to check his/her understanding.



## Activity 11

# Burning Fossil Fuels and Pollution

- In the previous lessons, you have learnt that extracting fossil fuel from the underground harms the environment and when burning this fuel to generate electrical energy, this pollutes the environment.
- People need energy to operate trains, cars and ships, and even more energy is needed to supply houses, schools and factories with electricity.
- To get this energy, the solution was to extract and use fossil fuels to generate electrical energy, where :
  - Coal, oil or natural gas is burned at electric power stations and the energy produced from burning fuel is used to generate electricity.
  - Then, the generated electricity is transferred to different places through electric wires.



## Harms of burning of fossil fuels on the environment

- ▶ Burning fuel not only produces electricity but also pollutes the environment, where burning of coal and oil produces **carbon dioxide gas** which causes :



1 Acid rains	2 Global warming
<p>Carbon dioxide gas combines with water in the air to form <b>carbonic acid</b>, resulting in acid rains that cause :</p> <ul style="list-style-type: none"><li>- The death of trees.</li><li>- Decomposition and dissolving of some rocks including bricks of buildings.</li><li>- Chemical changes in the structure of lakes causing the death of fish.</li><li>- Chemical changes in the structure of soil.</li></ul>	<p>Increasing the amount of carbon dioxide gas in the air forms a layer in the atmosphere that traps heat above the Earth's surface causing a slow rise in the Earth's temperature, which is known as <b>global warming</b>.</p>

## Notes for parents

- Discuss with your child the reasons and the bad effects of both acid rains and global warming.



## How to reduce acid rains and global warming

► **The best solution to reduce acid rains and global warming is to rationalize (decrease) the use of energy, where:**

- As we reduce our consumption of energy, the amount of burning of fossil fuel to generate energy decreases.
- As the amount of burning of fossil fuel decreases, the amount of carbon dioxide and other pollutants in the air which we breathe in will decrease.

### **Note**

Decreasing the use of energy not only reduces pollution but it also conserves non-renewable fossil fuels and keeps the Earth planet clean.



### Check your understanding

► **"Fossil fuels cause air and water pollution".**

**Based on this statement, complete the following sentences using these words :**

(carbon dioxide – temperature – chemical – atmosphere –  
carbonic – rocks)

#### The burning of fossil fuel causes

#### Effect

Spread of ..... and water vapour in the air.



Climate changes

Spread of harmful gases which combine with water in the air to form ..... acid.



..... changes in the structure of lakes and the decomposition of .....

The increase of carbon dioxide in the air forming a layer in the .....



Increasing the Earth's .....

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson (4) p. 54
- Self-Assessment (14)

• Let your child answer the questions to check his/her understanding.



# Lesson 5

## Activity 12

### Conserving Fossil Fuels

► Look at these pictures, then answer :

- Is fossil fuel used to cook food ?

Yes

No



- Is fossil fuel used to generate electricity to light homes ?

Yes

No



► From the previous lessons, you have learnt that how fossil fuels burn to generate electricity that lights our homes, so we should conserve this type of fuel, where:

- There is a limited amount of fossil fuels available on the Earth.
- Fossil fuels are formed over millions of years, this means what we use cannot be replaced as quickly as it is consumed.
- Fossil fuels are considered non-renewable natural resources of energy that will run out from the Earth if consumption is not rationalized.

#### Some methods of conserving fossil fuels



1. Walking or using bicycles instead of driving a car.



2. Turning off the lights when you are not in the room.



3. Replacing fossil fuels with renewable energy resources such as : solar energy, hydroelectric energy and wind energy.

#### Notes for parents

- Let your child mention some other ways to conserve fossil fuels.



## Disadvantages of using fossil fuels in energy production

- The amount of fossil fuels is limited and could run out.
- **When some forms of fossil fuels burn, they emit gases that cause :**
  - Air pollution.
  - Trap heat in the atmosphere, which raises the temperature of Earth planet and changes its climate. This phenomenon is known as **"global warming."**

### Note

The use of renewable energy resources instead of fossil fuels means that renewable energy resources will not run out and so this will not cause an increase in Earth's temperature but production of energy by using renewable energy resources is more expensive than using fossil fuels.



## Check your understanding

### Put (✓) or (✗) :

1. The amount of fossil fuel on Earth planet is unlimited. ( )
2. Producing energy from renewable resources is less expensive than producing energy from fossil fuels. ( )
3. Using cars instead of bicycles is one way to conserve fossil fuels. ( )
4. The gases emitted by the burning of fossil fuels pollute the environment. ( )



## Optional Digital Activity

Activity (13) " **The value of renewable resources** " in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

- Let your child answer the questions to check his/her understanding.



## Activity 14

### Using Fuel

- ▶ From the previous lessons, you have learnt about types of fuels, their forms and their uses, and you also have learnt that different forms of fuels can be renewable or non-renewable energy resources.
- From what you have learnt, classify the following renewable energy resources and non-renewable energy resources in the following table using these words :

(Charcoal – Gasoline – Oil – Solar energy –  
Natural gas – Wind energy – Wood)

Renewable energy resources	Non-renewable energy resources
.....	Coal
.....	.....
Water	.....
.....	Kerosene (one of oil products)
.....	.....



### Check your understanding

#### ▶ Give reasons for :

1. Water is considered as a renewable energy resource.  
.....
2. Coal is considered as a non-renewable energy resource.  
.....

#### In the Exercises Book :

##### Try to answer :

- Exercises on Lesson (5) p. 58
- Self-Assessment (15)
- Model Exam on Concept (3.2)

### Notes for parents

- Let your child answer the questions to check his/her understanding.



# Record Evidence Like A Scientist

- In this concept, you have learnt a lot about some types of fuels, their forms and their uses.
- **Now**, try to think like a scientist by writing your hypothesis (claim), your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learnt in the previous concepts.



## Step 1 The Question

Where does the fuel we use every day come from ?



## Step 2 My Hypothesis (Claim)

.....

.....

.....



## Step 3 My Evidence

.....

.....

.....

.....



## Step 4 My Scientific Explanation

.....

.....

.....

.....

.....



## Optional Digital Activity

Activity (16) "Oil drillers and underwater robots" in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

- Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her hypothesis, evidence and scientific explanation.



## Activity 17

# Review : About Fuel

- Fuel is one of the most important resources of energy that humans depend on to get energy.

### Fuel :

It is any substance that produces thermal energy when it is burned.

- The main source of thermal energy that is produced by fuel, is the Sun.

### • Different forms of fuels:

- Oil – natural gas – coal – wood.

### • Uses of some different forms of fuels:

1. Cooking food, where coal, natural gas or wood may be used.
2. Generating electricity, where oil, natural gas or coal may be used.
3. Warming, where coal or wood may be used.
4. Operating all means of transportation, where gasoline (oil) or natural gas may be used.

## Energy resources

### 1. Renewable energy resources :

- They are natural resources that can be replaced after a short period of time of use, such as water, solar energy and wind energy.

### 2. Non-renewable energy resources :

- They are natural resources that are used at a rate faster than they can be replaced, such as coal, natural gas and oil.

## Types of fuels

### 1. Biofuel : It is a fuel that is produced from living organisms that can be planted.

- Its primary source : The Sun.
- Biofuel is a renewable energy resource.

### Examples :

- Wood
- Charcoal
- Some types of plants such as grass, corn and wood chips can be used to make a liquid fuel.

## Notes for parents

- Help your child review the main points in this concept.



**2. Fossil fuel :** It is a fuel that is produced from old living organisms (plants or animals) that were buried and decomposed over a long period of time.

- Its primary source : The Sun.
- Fossil fuel is a non-renewable energy resource.

**Examples :**

- **Oil and natural gas** are formed when the remains of marine organisms were decomposed.
- **Coal** is formed when the remains of plants were decomposed.

---

### Conservation of oil

- Reducing the use of private vehicles.
- Using of public means of transportation.

### Conservation of water

- Avoid wasting or polluting water.
- Growing plants that don't need large amounts of water for irrigation.

### Conservation of electricity

- Turning off lights when they are not needed.
- Unplugging electrical appliances when not in use.

- 
- Burning of coal and oil produces carbon dioxide gas which causes :
    - Acid rains.
    - Global warming.

- **Acid rains** cause :

- Death of trees.
- Decomposition and dissolving of some rocks.
- Chemical changes in the structure of lakes causing the death of fish.
- Chemical changes in the structure of soil.

- **Global warming** :

- Increasing the amount of carbon dioxide gas in the air causing increasing the temperature of the Earth's surface.

---

### Conservation of fossil fuels

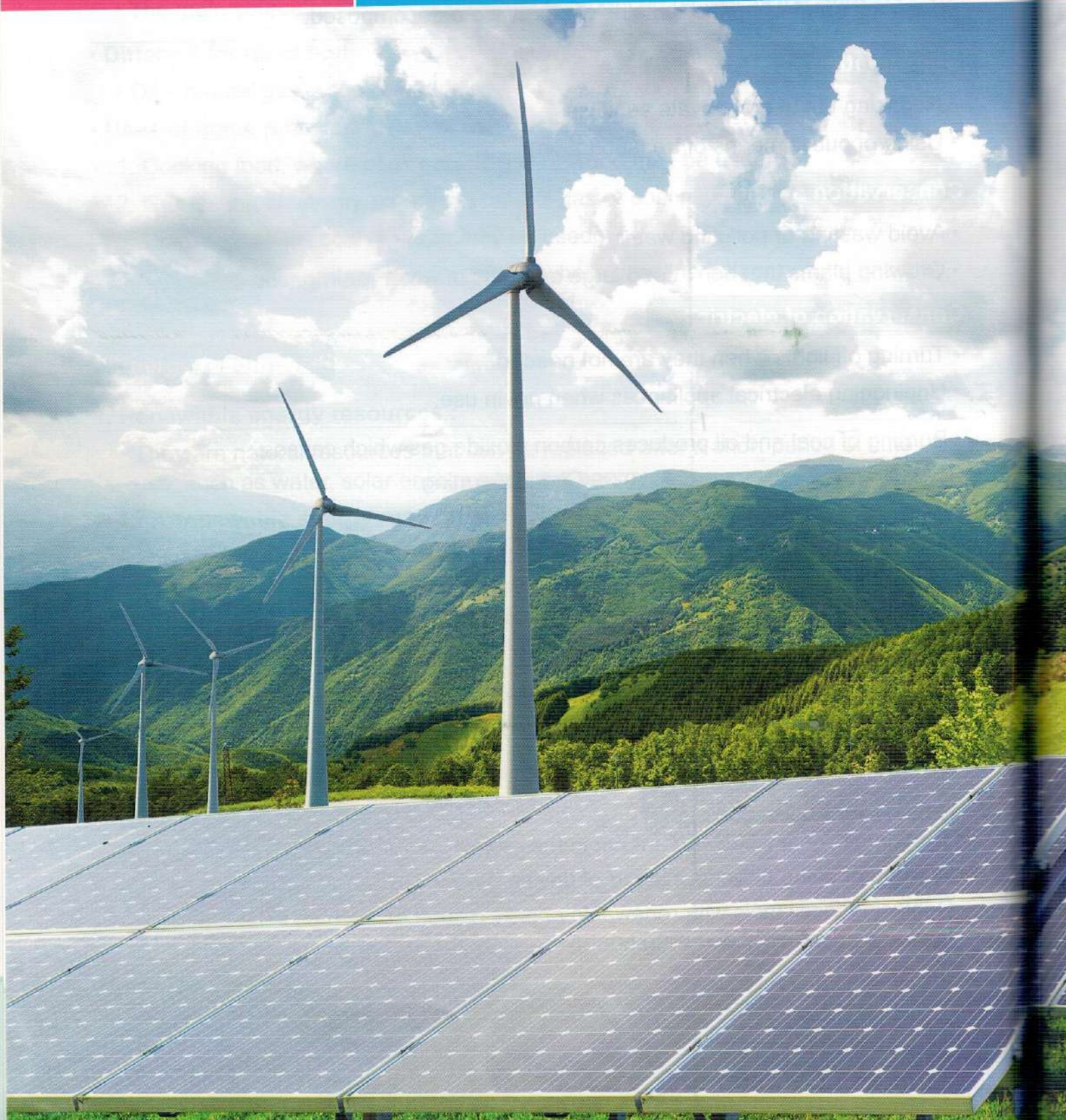
- Turning off lights when you are not in the room.
- Walking or using bicycles instead of driving a car.
- Replacing fossil fuels with renewable energy resources such as solar energy, hydroelectric energy and wind energy.




Concept

3.3

# Renewable Energy Resources







## Learning outcomes

**By the end of this concept, your child will be able to :**

- Apply scientific ideas to design, test and refine devices that convert energy from one form to another.
- Explain the use of renewable energy resources in the generation of electricity.
- Develop models based on observation and evidence that energy is transferred from place to place.

## Key vocabulary

- |                |              |
|----------------|--------------|
| • Heat         | • Turbine    |
| • Light        | • Watermills |
| • Radiation    | • Windmills  |
| • Solar energy |              |



# Lesson

# 1

## Activity 1

## Can You Explain?



► **What are the various methods for generating electricity from renewable energy resources ?**

- From the previous pictures, we notice that the examples of renewable energy resources include :

Solar energy (sunlight), wind and water.

- Electricity can be generated using the previous renewable energy resources in different ways, where :
  - **Solar panels** use solar energy to generate electricity which is used to light streets.
  - **Windmill** turbines generate electricity by using the kinetic energy of wind.
  - **Watermill** turbines generate electricity by using the kinetic energy of water.

► **In this concept, we will study :**

- Windmills and watermills.
- Renewable energy resources.
- The Sun and the use of solar energy.
- Ways to generate useful energy using the wind movement.
- Ways to generate electricity using the kinetic energy of water.

### Notes for parents

- Help your child read more about generating electricity from some online sources.



## Activity 2

# Windmills and Watermills

► Put (✓) in front of the device that is operated with electricity :



• Manual mixer. ( )



• Electric mixer. ( )

- You know that most of the devices around us need electricity to be operated, but how did humans use devices hundreds of years ago before electricity ?

### Windmills and watermills

- Hundreds of years ago, people needed machines to make their lives easier, for example, they used windmills and watermills which helped them to grind grain to make flour.
- The following table shows the energy used in windmills and watermills as well as the advantages and disadvantages of each :

Points of comparison	Windmills	Watermills
<b>Energy used :</b>	The wind movement generates <b>kinetic energy</b> which moves the mill's blades, then kinetic energy goes to other parts of the mill to grind the grain.	The water movement generates <b>kinetic energy</b> which moves the mill's blades, then kinetic energy goes to other parts of the mill to grind the grain.
<b>Advantages :</b>	<ul style="list-style-type: none"><li>• Low cost.</li><li>• Renewable energy resource.</li></ul>	<ul style="list-style-type: none"><li>• Low cost.</li><li>• Renewable energy resource.</li></ul>
<b>Disadvantages :</b>	Sometimes the wind does not blow and the windmills do not move, so they are unable to do their job.	The water supply may dry up and the watermills do not move, so they are unable to do their job.

• Discuss with your child how windmills and watermills can be used to generate electricity.



### **Note**

Modern wind turbines and old windmills vary in shape and number of blades, but both are used to generate electricity.



Modern wind turbines



Old windmills



### **Check your understanding**

#### ► Put (✓) or (✗) :

1. Hundreds of years ago, people used windmills and watermills to grind grain to make flour. ( )
2. All mills depend on the kinetic energy of wind only in order to be operated. ( )
3. From the advantages of windmills and watermills is that they are low cost. ( )
4. The kinetic energy of water is responsible for the movement of windmills. ( )

### **Notes for parents**






- Let your child answer the questions to check his/her understanding.



### Activity 3

## What Do You Already Know About Renewable Energy Resources ?

- You have known that any device we use needs energy to be operated.
- The following table shows examples of renewable and non-renewable energy resources :

Energy resource	Renewable or Non-renewable	Example
Battery	Non-renewable	 Flashlight
Gasoline	Non-renewable	 Car engine
Solar panels (sunlight)	Renewable	 Lighting lamps
Coal used in electric power stations	Non-renewable	 Fan
Natural gas	Non-renewable	 Stove

\* Let your child mention other devices and the type of energy used to operate them.





## Check your understanding

- Write in the table below whether the following energy resources are renewable or non-renewable :

Energy resource	Renewable or Non-renewable
Electricity generated by windmills.	.....
Gasoline.	.....
Electricity generated by water turbines.	.....
Coal.	.....
Natural gas.	.....

### In the Exercises Book :

Try to answer :

- Exercises on Lesson ① p. 62
- Self-Assessment ①⑥

## Notes for parents

- Let your child answer the questions to check his/her understanding.



# Lesson 2

## Activity 4 The Sun

► Look at the following pictures, then put (✓) or (✗):



Plant (1)  
(In a dark room)



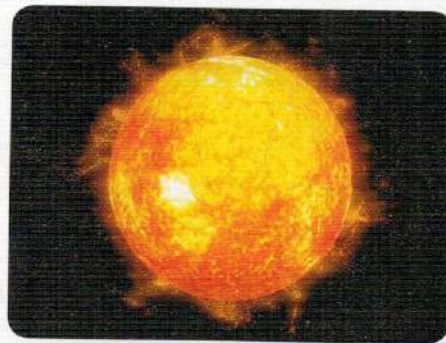
Plant (2)  
(In a lighted room)

1. Plants require water only to grow. ( )
2. Plant (1) requires sunlight in order to grow. ( )
3. Green leaves of plant (2) will turn yellow. ( )

- You have learnt that the Sun is a source of light and it comes at the start of the energy chains.
- Let's know how the Sun is important to keep life on Earth.
- The Sun provides us with **light** and **heat**.
- Plants need sunlight to grow and without the Sun, plants would not be able to survive, so they will die and the animals that eat them will die, too, so life on Earth will disappear.

### The Sun

- The Sun is a **star** and like all stars, it is made up of gases (mostly **hydrogen** and **helium** gases).
- The Sun does not have a hard surface like the moon, but it has a surface known as the "**photosphere**".
- The **photosphere** is the gas layer at the surface of the Sun, where the light we see is emitted.



The photosphere of the Sun

- Discuss with your child the structure of the Sun and also its importance for living organisms.



### ► How does the Sun produce light and heat ?

- The energy of the Sun comes when hydrogen and helium gases in the Sun react at very high temperatures, producing huge amounts of light and heat.
- Light and heat travel through space in the form of **waves**, some of these waves reach the Earth.



#### **Note**

Do not look directly at the Sun as its rays are too strong and can harm your eyes.

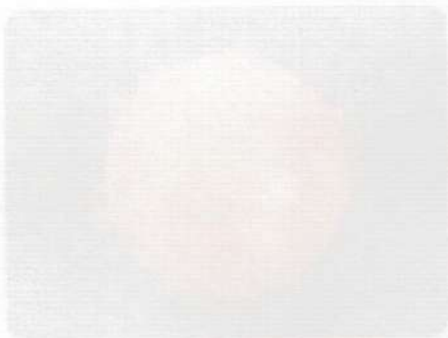


### **Check your understanding**

#### ► Complete the following sentences using the words below :

(light – hydrogen – waves – heat – photosphere – helium)

1. The Sun is made up of gases mostly ..... and .....
2. Huge amounts of ..... and ..... are produced when hydrogen and helium gases react at very high temperatures.
3. Light and heat from the Sun travel through space in the form of ..... that reach the Earth.
4. The gas layer at the surface of the Sun where the light we see is emitted is called the .....



### **Notes for parents**

- Let your child answer the questions to check his/her understanding.



## Activity 5

# Using Energy From the Sun

- In the previous activity, you have learnt how the Sun is important to living organisms, as most plants and animals need the Sun to survive.
- **Now**, let's know how the energy of the Sun reaches us on Earth and how we use it in our daily life.
- At night when the Sun is not visible in the sky, you can feel warm because :
  - The atmosphere absorbs the energy of the Sun.
  - Land and water on Earth's surface absorb the energy of the Sun, which causes a rise in the Earth's temperature.

### Solar energy

- The energy comes from the Sun is called "**solar energy**", which is radiant light and heat from the Sun.
- The solar energy that is produced by the Sun contains a type of energy called "**radiant energy**" (radiation) which is found in the Sun rays.

### Uses of solar energy

#### Direct source of thermal energy

Solar energy can be used directly as a source of thermal energy when exposing yourself to the Sun to feel warm.



#### In greenhouses

Where, greenhouses allow the entry of solar energy (especially radiant energy) that comes from the Sun, then this radiant energy is converted into thermal energy that warms the inside of the greenhouses, which helps farmers to plant the crops that only grow in warm climates.



#### In warming houses

Where, houses can be built in a way that enables the energy of the Sun to warm them by placing large windows on the walls that face the Sun for most of the day.



- Discuss with your child the different uses of solar energy.



### In cooking food

Where, curved mirrors are used to collect and focus Sun rays to heat metal pots and cook the food inside.



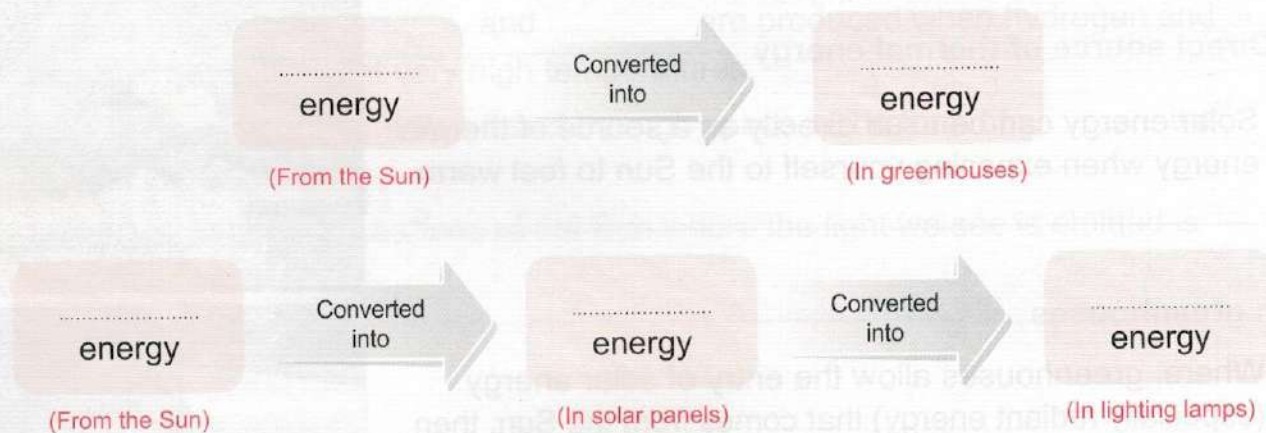
### In heating water

Where, panels made of black pipes can be placed on the roof of houses to heat the water when it passes through these pipes, then the heated water is stored in a water tank to be used later.



## Check your understanding

### ► Complete the following energy chains :



### Notes for parents

- Let your child answer the questions to check his/her understanding.



## Activity 6

# Solar Energy

- You already know the source and uses of solar energy.
- **Now**, we will study how solar panels convert solar energy coming from the Sun.

### Solar panels

Solar panels can be very small that they can supply only one light bulb with energy, or very large that they can supply buildings or cities with energy.

#### ► How do solar panels work?

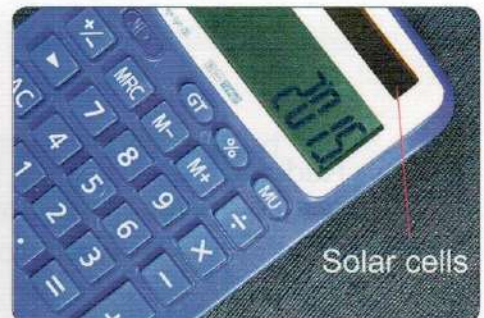
- Solar panels are composed of many small solar cells.
- These cells capture solar energy (especially radiant energy) coming from the Sun and convert it directly into **electrical** energy or **thermal** energy.
- Most solar panels are used to generate **electricity**.



Solar panels

### Uses of electricity generated by solar panels

- This electricity can be used directly to light the streets.
- This electricity is used to recharge some types of batteries, like some calculators with small solar cells.
- This electricity is used in houses to operate various electric devices.
- This electricity is used to operate irrigation equipment in some villages.



Calculator with small solar cells



### Check your understanding

- In the table below, classify the following energies in the solar panel system into input and output energy :

(Solar energy – Electrical energy – Thermal energy)

Input energy	Output energy
.....	.....

- Let your child mention some other electric devices that can be operated using the solar panels.

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson ② p. 66
- Self-Assessment ⑰



# Lesson 3

## Activity 7

## Harness the Wind

► Put (✓) next to the renewable energies :



Coal



Water



Wind



The Sun

**Now,** let's know how wind turbines convert kinetic energy of the wind into electricity.

### Using energy of the wind

Different amounts of solar energy (especially radiant energy) reach different regions of the world.



Radiant energy causes the air around the globe to heat up to different degrees, where the difference in temperature between cold and hot air causes air to move and wind to blow.



Kinetic energy of the wind movement is used to rotate the blades of windmills.



When the windmill blades rotate, this causes wind turbines inside the windmill to rotate, generating electrical energy that is transmitted through huge wires in power lines to different places such as houses and factories.



### Notes for parents

- Discuss with your child how wind energy can be used to generate electricity.



► The following diagram shows the energy chain of the wind turbines :



### Note

#### • In water turbines :

- When the number of blades **decreases**, they rotate **faster**, so the efficiency of wind turbine **increases**.
- When the kinetic energy of wind **increases**, the blades rotate **faster**, so the efficiency of wind turbine **increases**.
- When the wind blows from **the side** of wind turbine, the blades rotate **faster**, so the efficiency of wind turbine **increases**.
- When the wind blows from **the front** of wind turbine, the blades rotate **slower**, so the efficiency of wind turbine **decreases**.



### Check your understanding

► Put (✓) or (✗) :

1. Kinetic energy of the wind is converted into electrical energy by wind turbines. ( )
2. Wind is a non-renewable energy resource. ( )
3. The difference in air temperature around the globe causes air to move and wind to blow. ( )
4. Wind turbine blades rotate at a slower speed as wind kinetic energy increases. ( )
5. The efficiency of the wind turbine can be increased by increasing the number of its blades. ( )
6. The speed of the wind turbine blades varies with the direction of wind movement. ( )



### Optional Digital Activity

Activity (8) "Building a Turbine" in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson (3) p. 70
- Self-Assessment (18)

• Let your child answer the questions to check his/her understanding.



# Lesson

# 4

## Activity 9

## Falling Water

► Look at the following pictures, then put (✓) or (✗):



Turbine (1)



Turbine (2)

1. Turbines (1) and (2) are used to generate electricity. ( )
2. Turbine (2) uses the kinetic energy of water to generate electricity. ( )
3. Turbine (1) is used in places, where there are strong winds to generate electricity. ( )

- You have known that wind can be used to generate electricity.

- **Now**, we will study how water can be used to generate electricity.

- Rivers flow downhill and during this process the **gravitational potential energy** of water is converted into **kinetic energy** that helps rotate water turbines to generate electricity.

- Dams are built on rivers to control the water flow and increase the potential energy of water to generate electricity.



### Falling water

► How can electricity be generated from dams using water turbines ?

1

The flow of water can be controlled to generate electricity, as the dam prevents the flow of water, so the potential energy of water increases.



Water dam

### Notes for parents

- Discuss with your child how the energy of running water can be used to generate electricity.



2 When water is released, it flows through water turbines in dams.

3 The flow of falling water helps water turbines rotate and generate electricity.

4 This electricity is sent through long electric wires to the places where it is needed, and this type of electricity is called "hydroelectric energy" or "hydroelectricity".

### Hydroelectric energy (hydroelectricity):

It is a type of electrical energy generated by water turbines in dams.

The following table shows the similarities and differences between the use of water and the use of wind to generate electricity :

The use of water to generate electricity	The use of wind to generate electricity
Differences	
Water is used in places where dams are built on rivers.	Wind is used in places with strong winds.
Similarities	
- Both of them are renewable energy resources.	- Both of them use kinetic energy.
- Both of them operate turbines.	- Both of them generate electricity.



### Check your understanding

► Complete the following sentences using the words below :

(wind turbines – water turbines – hydroelectric energy)

1. Water flows through ..... in dams to generate electricity.
2. The electrical energy generated by water turbines in dams is known as .....
3. In places with strong winds, ..... are used to generate electricity.

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson 4 p. 73
- Self-Assessment 19

- Discuss with your child the meaning of hydroelectricity.



# Lesson 5

## Activity 10

## Modeling a Turbine Generator

► Look at the opposite picture, then answer the questions :

- Can electricity be generated using the opposite water turbine ?

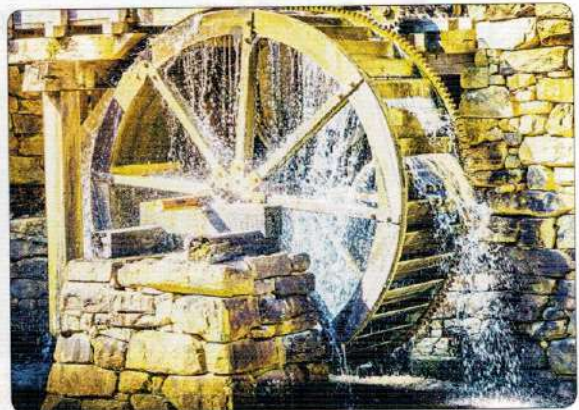
Yes

No

- Can electricity be generated if the water flow to the turbine is cut off ?

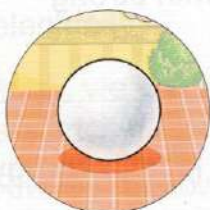
Yes

No



- You have learnt how the energy of water movement is used to generate hydroelectric energy.
- **Now**, you will design a model of a water turbine.

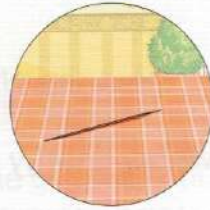
### ► Tools



Ball of white cork



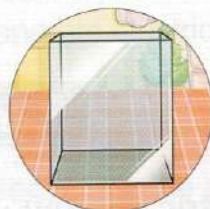
4 plastic spoons



Toothpick



3 wooden sticks



Bowl



Jug



Wax gun

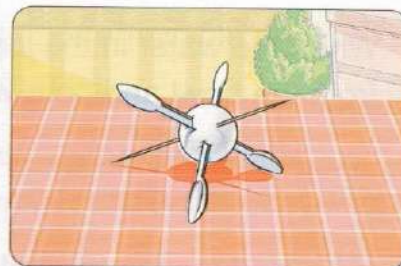
### Notes for parents

- Help your child make a model of water turbine.

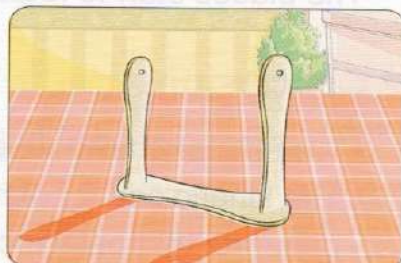


## Steps

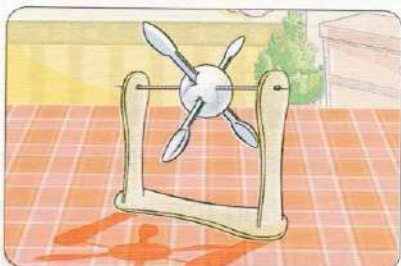
1. Make the blades of the water turbine using the ball of cork, four plastic spoons and the toothpick as shown in the opposite figure.



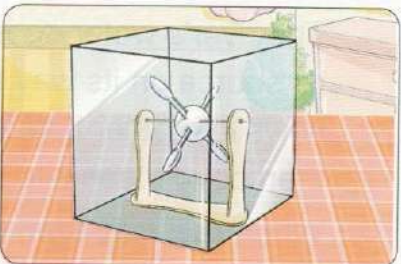
2. Make the base of water turbine by using the three wooden sticks and the wax gun as shown in the opposite figure.



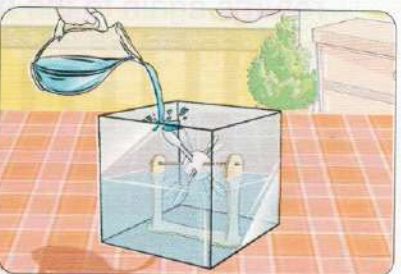
3. Fix the blades to the base as shown in the opposite figure.



4. Place the turbine inside the bowl.



5. Fill the jug with water, then pour it over the blades.

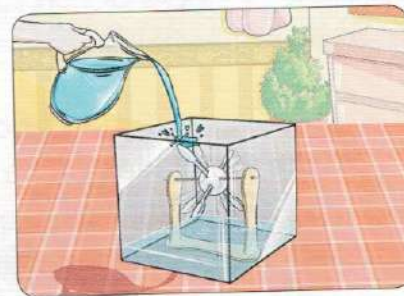


## Observation

The blades rotate when water is poured over them and stop when the water inside the jug is completely run out.



6. When the water in the jug runs out, refill it with water from the bowl and pour water over the blades again.



### ► Observation

The blades start to rotate again.

### ► Conclusions

- Water is a renewable energy resource.
- The kinetic energy of moving water in rivers is used to rotate water turbines to generate hydroelectric energy.

### 💡 Note

In the previous activity, the water used to rotate the blades was not run out but renewed by filling the jug again, which simulates what is happening on the Earth, where :

- The river's water does not return back to its source on its way through the dam but it flows into other bodies of water, evaporates then condenses into clouds.
- When rain falls from these clouds, the water returns again to the river and this is called the **water cycle**.



The water cycle



### Check your understanding

#### ► Put (✓) or (✗) :

1. Water is a non-renewable resource that is used to generate hydroelectric energy. ( )
2. In the water turbine, kinetic energy is converted into hydroelectric energy. ( )

### Notes for parents

- Discuss with your child the meaning of water cycle.

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson (5) p. 76
- Self-Assessment (20)
- Model Exam on Concept. (3,3)
- Model Exam on Theme (3)



## Record Evidence Like A Scientist

- ▶ In this concept, you have learnt a lot about renewable and non-renewable energy resources and the benefits of using renewable energy resources.
- **Now**, try to think like a scientist by writing your hypothesis (claim), your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learnt in the previous concepts.

### Step 1 The Question

What are the different ways to use renewable energy resources to generate electricity ?

### Step 2 My Hypothesis (Claim)

.....

.....

### Step 3 My Evidence

.....

.....

.....

### Step 4 My Scientific Explanation

.....

.....

.....

### Optional Digital Activity

Activity (12) "**Solar Energy in Space**" in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

- Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her hypothesis, evidence and scientific explanation.



## Activity 13

# Review : Renewable Energy Resources

► We can summarize this concept with the following main points :

- Hundreds of years ago, people needed machines to make their lives easier, so they used windmills and watermills to help them grind grain to make flour.
- The following table shows the energy used in windmills and watermills as well as the advantages and disadvantages of each :

Points of comparison	Windmills	Watermills
Energy used :	Kinetic energy of wind.	Kinetic energy of water.
Advantages :	<ul style="list-style-type: none"><li>• Low cost.</li><li>• Renewable energy resource.</li></ul>	<ul style="list-style-type: none"><li>• Low cost.</li><li>• Renewable energy resource.</li></ul>
Disadvantages :	Sometimes the wind does not blow and the windmills do not move, so they are unable to do their job.	The water supply may dry up and the watermills do not move, so they are unable to do their job.

- The Sun is a star which is made up of gases (mostly **hydrogen** and **helium**).
- The Sun has a **photosphere** which is the gas layer at the surface of the Sun, where the light we see is emitted.
- The energy of the Sun comes when hydrogen and helium react at very high temperatures, producing huge amounts of light and heat that travel through space in the form of waves, some of these waves reach the Earth.
- The energy from the Sun is called "**solar energy**", which is radiant light and heat from the Sun.
- The solar energy that is produced by the Sun contains a type of energy called "**radiant energy**" (radiation) which is found in the Sun rays.

### Notes for parents

- Help your child review the main points in this concept.



### • Uses of solar energy :

- Solar energy is a direct source of thermal energy when exposing yourself to the Sun to feel warm.
- In greenhouses, radiant energy is converted into thermal energy which warms the inside of the greenhouses.
- In warming houses, by placing large windows on the walls that face the Sun for most of the day.
- In cooking food, where curved mirrors are used to collect and focus Sun rays to heat metal pots and cook the food inside.
- In heating water, where panels made of black pipes can be placed on the roof of houses to heat the water.

• **Solar panels** are composed of many small solar cells that capture solar energy (especially radiant energy) and convert it into electrical or thermal energy.

### • Uses of electricity generated by solar panels :

- Light the streets.
- Recharge some types of batteries, like some calculators with small solar cells.
- Operate various electric devices in houses.
- Operate irrigation equipment in some villages.

### • The following diagram shows the energy chain of the wind turbines:



### • In water turbines :

- When the number of blades **decreases**, they rotate **faster**, so the efficiency of wind turbine **increases**.
- When the kinetic energy of wind **increases**, the blades rotate **faster**, so the efficiency of wind turbine **increases**.
- When the wind blows from **the side** of wind turbine, the blades rotate **faster**, so the efficiency of wind turbine **increases**.
- When the wind blows from **the front** of wind turbine, the blades rotate **slower**, so the efficiency of wind turbine **decreases**.



• **Water is used to generate electricity, as :**

- Rivers flow downhill, the gravitational potential energy of water is converted into kinetic energy that helps rotate water turbines to generate electricity.
- Dams are built on rivers to control the flow of water and increase the potential energy of water to generate electricity.

**Hydroelectric energy (hydroelectricity):**

It is a type of electrical energy generated by water turbines in dams.

• **The following table shows the similarities and differences between the use of water and the use of wind to generate electricity :**

The use of water to generate electricity	The use of wind to generate electricity
<b>Differences</b>	
Water is used in places where dams are built on rivers.	Wind is used in places with strong winds.
<b>Similarities</b>	
<ul style="list-style-type: none"> <li>- Both of them are renewable energy resources.</li> <li>- Both of them operate turbines.</li> </ul>	<ul style="list-style-type: none"> <li>- Both of them use kinetic energy.</li> <li>- Both of them generate electricity.</li> </ul>

• **Water is a renewable energy resource, where :**

- The river's water does not return back to its source on its way through the dam but it flows into other bodies of water, evaporates, then condenses into clouds.
- When rain falls from these clouds, the water returns again to the river and this is called the water cycle.



# UNIT THREE Project

## Dams Impacts

► Read the following paragraph to learn some facts about dams.

- In modern times, scientists and engineers use the kinetic energy found in river water to generate electrical energy by building dams on rivers to control the flow of river water and use it to rotate water turbines that generate electricity.
- The construction of dams on rivers to generate electricity depends on the idea of making artificial waterfalls to simulate natural waterfalls, in order to increase the kinetic energy of river water, which is used to rotate water turbines to generate a type of electrical energy known as **hydroelectric energy**.



Water dam

**The construction of dams has many advantages and benefits for humans and the environment, such as :**

- Providing people with the electrical energy needed for lighting and operating different devices in homes, factories... etc.
- Helping people control the level of the river water to protect the agricultural lands on both sides of the river from the danger of flooding.

**However, the construction of dams also has many disadvantages and negative effects on humans and the environment, such as :**

- Changing the path of rivers, which affects the migration of fish through those rivers, which causes the death of fish or their migration to other water areas, so people are affected as they depend on fish as a source of food.
- Lakes that are formed behind dams cover large areas of land with a very big amount of water and these lands are considered as a habitat to many animals and plants, so this leads to the death of these animals and plants or the migration of these animals to other areas.



Flood

• Let your child make a research about the effect of building dams and share it with his/her friends.



Use the previous paragraph, other printed or online sources to make a research project about dams. Your research must include the following main points:

- An energy chain shows the energy changes of the kinetic energy of moving water to get electrical energy in a dam.
- Advantages of building dams for humans and environment.
- Disadvantages of building dams for humans and environment.
- Finding a solution to one of the problems of building dams.

#### Energy chain of a dam :

#### Advantages of building dams :

#### Disadvantages of building dams :

#### A solution to one of the problems of building dams :



# INTERDISCIPLINARY Project

## Sunny Side Up

- In many villages around the world, people depend on wood of trees as fuel to cook food and for this reason people in these areas cut down a lot of trees, which causes the removal of a lot of forests worldwide, which has negative effects on the whole world, such as :

- The disappearance or death of some animals that lived in these forests before they were removed.
- The disappearance of many types of plants that are used in the manufacture of medicines.



Deforestation

- **Deforestation** can be stopped by using solar energy instead of wood of trees as a source of energy for cooking food, as solar energy is free, clean and renewable energy.

But, there are some difficulties that humans face when using solar energy as a source of energy, including :

- The materials used to collect solar energy are very expensive.
- The amount of sunlight that reaches the Earth is not the same from one place to another on the Earth's surface.

- A solar cooker is a device that converts solar energy into thermal energy used in cooking food.

It contains metal plates placed in a certain way to collect the largest amount of solar energy and focus it in one area, and it also contains materials that keep the generated thermal energy inside the solar cooker for a period of time enough to cook food inside.



Solar cooker

- In this project, use the steps of the "**Engineering Design Process**" that you have learnt in the previous educational grades to create a model of a **Solar Cooker** that can be used in sunny regions to cook food.



## Note

Scan the opposite QR code with your smart phone to watch a video about how to use simple materials to create a model of a solar cooker.

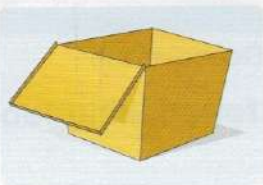


## Idea

Create a model of a solar cooker that can be used to cook food using some simple materials.

## Materials

You may use the following materials to create your solar cooker :



Carton box



Glue



Black paper sheet



Aluminium foil



White cork sheets



Transparent plastic sheet



Wooden stick

## Plan

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



## Build

Draw the design of your solar cooker model.

## Test

Test your solar cooker and write your observations and problems you may find in your model.

## Improve

Write down your ideas to improve your solar cooker model.



# Glossary





## Concept 2.4

Airbag	وسادة هوائية
Accident	حادث
Bat	مضرب
Balance	ميزان
Collision	تصادم
Collide	يصطدم
Conversion	تحويل
Cricket	لعبة الكريكيت
Cushion	وسادة
Crash	تحطم
Clay	صلصال
Crash investigator	محقق التصادم
Car manufacturers	صانعي السيارات
Driver	سائق
Dashboard	لوحة عدادات السيارة
Deflate	يفرغ الهواء
Endanger	معرض للخطر
Examine	يفحص
Fold	مطوى
Forceful	قوي
Inflate	يتنفخ
Irregular	غير منتظم
Injuries	إصابات
Laws	قوانين
Mass	كتلة
Moment	لحظة
Marble	بلى
Nylon	النايلون
Newton's cradle	لعبة نيوتن
Popping sound	صوت فرقعة
Passenger	راكب
Post	عمود
Suddenly	فجأة
Safety equipment	معدات الأمان
Seatbelt	حزام الأمان
Steering wheel	عجلة القيادة
Sensors	حساسات
Severe	شديد / حاد
String	خيوط / وتر

Scene  
Traffic sign  
Tasks  
Vehicle  
Vents  
Wrecking ball  
Wobble

مشهد  
علامة مرور  
مهمات  
مركبة  
ثقب / فتحات  
كرة التدمير  
يردد / يهتز

## Concept 3.1

Convert  
Conservation of energy  
Control remotely  
Chemical energy  
Consumed energy  
Coal  
Create  
Device / Equipment  
Destroy  
Distant  
Exploration  
Energy chain  
Electrical energy  
Emit  
Electric power station  
Energy path  
Friction  
Generate  
Illuminate  
Kinetic energy  
Mars  
Mission  
Nowadays  
Potential energy  
Produced energy  
Rover  
Recharge  
Run out  
Robot  
Sound energy  
Solar panels  
Spring

يتحول  
حفظ الطاقة  
التحكم عن بُعد  
طاقة كيميائية  
طاقة مستهلكة  
فحم  
يخلق  
جهاز  
يدمر / يفتى  
بعيد  
استكشاف  
سلسلة الطاقة  
طاقة كهربية  
يشع  
محطة قوى كهربية  
مسار الطاقة  
احتكاك  
يولد  
يضيئ  
طاقة حركة  
المريخ  
مهمة  
فى الوقت الحاضر  
طاقة وضع  
طاقة ناتجة  
متجول  
إعادة شحن  
نفذ  
انسان آلى  
طاقة صوتية  
ألواح شمسية  
زنبرك



Solar energy  
Thermal energy  
Tyre  
Tracking  
Wasted energy

طاقة شمسية  
طاقة حرارية  
أطوار العجلة  
تتبع  
طاقة مهددة

### Concept 3.2

Alternative  
Acid rains  
Atmosphere  
Appliances  
Burn  
Biofuel  
Buried  
Consume  
Charcoal  
Conserve  
Carbon dioxide gas  
Carbonic acid  
Climate  
Concern  
Deforestation  
Decomposed  
Disadvantages  
Extracted  
Engine  
Expensive  
Fuel  
Forms  
Formation  
Fossil fuel  
Gasoline pointer  
Generator  
Global warming  
Gasoline  
Hydroelectric energy  
Harms  
Irrigation  
Irritate  
Instead of  
Layer

بديل  
أمطار حمضية  
الغلاف الجوي  
أجهزة  
يحترق  
وقود حيوي  
مدفون  
يستهلك  
فحم نباتي  
يرشد  
غاز ثاني أكسيد الكربون  
حمض الكربونيك  
مناخ  
اهتمام  
أزالة الغابات  
متحلل  
عيوب  
مُستخرج  
محرك  
غالي  
وقود  
صور  
تكوين  
وقود حفري  
مؤشر البنزين  
مولد  
احتباس حراري  
بنزين  
طاقة كهرومائية  
أضرار  
رى  
يُهيج  
بدلاً من  
طبقة

Living organisms  
Lifetime  
Limited  
Marine  
Mud  
Natural gas  
Notice  
Non-renewable  
Operating  
Oil rigs  
Oil  
Pressure  
Pollutants  
Phenomenon  
Pesticides  
Rotate  
Renewable  
Rationalize  
Rapid  
Remains  
Resources  
Several  
Swamps  
Settle  
Sediments  
Steam  
Smog  
Set laws  
Structure  
Transform  
Turbines  
Trap  
Unplugging  
Warming  
Wheels  
Wind energy  
Wood chips

كائنات حية  
العمر  
محدود  
بحري  
طين  
غاز طبيعي  
بلاخط  
غير مُتجدد  
تشغيل  
حفارات النفط  
نفط  
ضغط  
ملوثات  
ظاهرة  
مبيدات حشرية  
يدور  
مُتجدد  
يرشد  
سريع  
بقايا  
مصادر  
متعدد  
مستنقعات  
يستقر  
رواسب  
بخار  
ضباب / دخان  
يضع قوانين  
تركيب  
يتحول  
توربينات  
يحبس  
يفصل  
تدفئة  
عجلات  
طاقة رياح  
رقائق الخشب



### Concept 3.3

Absorb	يمتص
Blow	تهب
Bowl	وعاء
Capture	يلتقط
Curved mirrors	مرايا منحنية
Crops	محاصيل
Calculator	آلة حاسبة
Cork	الفلين
Condense	تكثف
Cycle	دورة
Disappear	يختفي
Degrees	درجات
Downhill	إنحدار
Efficiency	كفاءة
Evaporate	تتبخر
Enables	تمكن
Flashlight	مصباح يلمى
Grind grain	طحن الحبوب
Greenhouse	صوبة زجاجية
Globe	كرة أرضية
Gravitational	الجاذبية
Harness	تسخير
Jug	إبريق
Low cost	تكلفة منخفضة
Machines	الآلات
Metal pots	أواني معدنية
Pipes	أنابيب
Depend on	يعتمد على
Roof	سطح
Radiation	إشعاع
Radiant	مشع
Refill	إعادة تعبئة
Stove	موقد
Star	نجم
Survive	يحيى / يعيش
Supply	إمداد
Simulates	يحاكى
Toothpick	عود أسنان
Villages	القرى

Wooden sticks  
Windmills  
Watermills  
Waves

عصى خشبية  
طواحين هوائية  
طواحين مائية  
موجات



# This Exercises Book

Includes Three Parts

Part

1

## Exercises on Lessons

(Page 3)

**Includes :**

Variant questions on each lesson of concepts.



**Note**

All questions in this part are classified according to Bloom's taxonomy.



Part

2

## Self-Assessments

(Page 78)

**Includes :**

- Cumulative self-assessments on lessons of each concept.
- A model exam on each concept.
- A model exam on Theme (3).



Part

3

## Final Examinations

(Page 116 )

**Includes :**

- Models of final examinations on the second term.

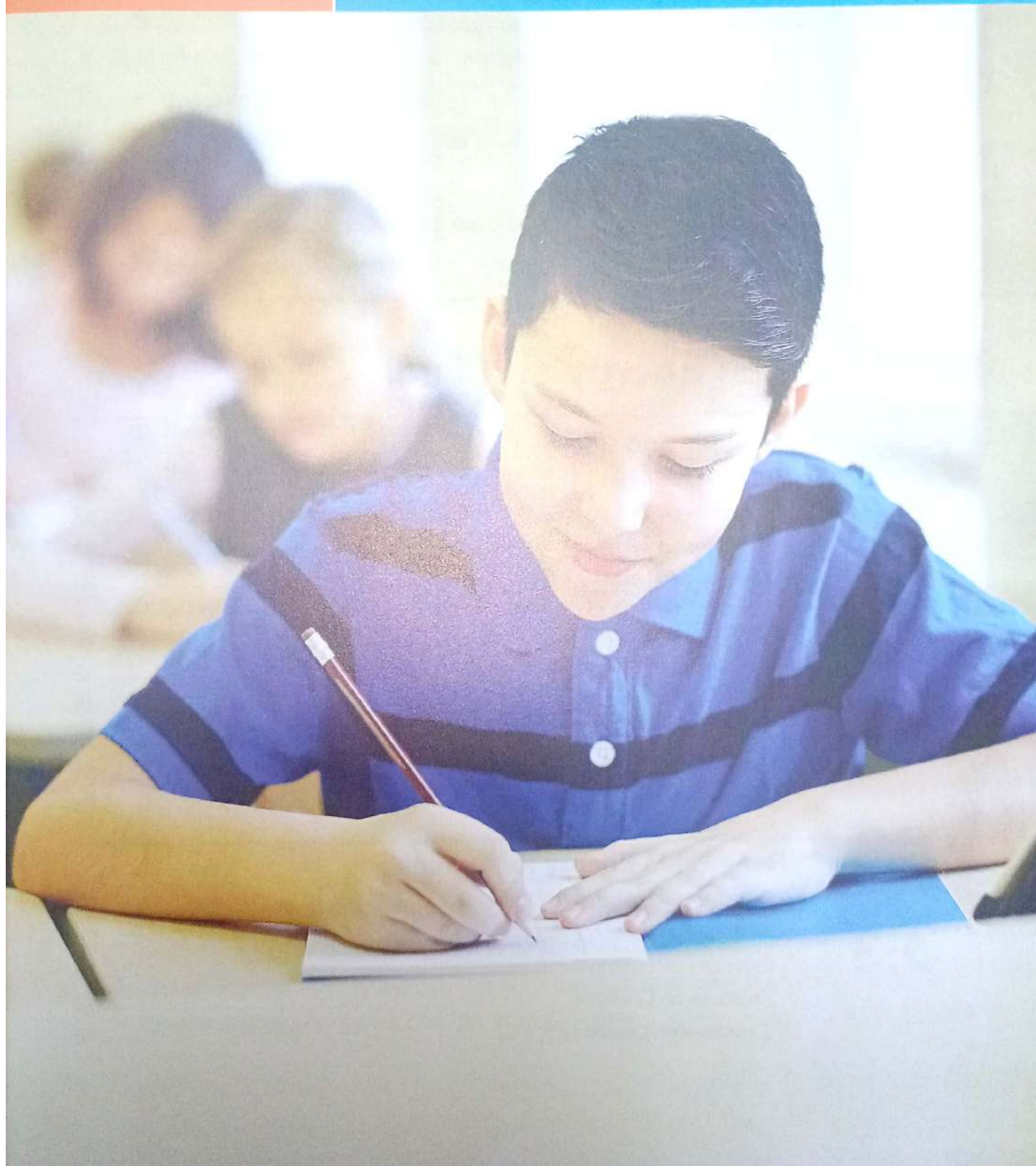




Part

1

# Exercises on Lessons





# Exercises

## on Lessons of Concept (3.1)

● Understand

● Apply

● Analyze

● Evaluate

● Create

### Exercises on Lesson 1

#### 1 Choose the correct answer :

- 1. Toy cars need energy to do all the following functions, except .....
  - a. moving forward and backward.
  - b. rotation in a circle.
  - c. moving right and left.
  - d. rotation around the moon.
- 2. In the battery of a toy car ..... energy changes into electrical energy.
  - a. chemical
  - b. sound
  - c. light
  - d. thermal
- 3. Electrical energy produced from a toy car battery can be changed into ..... , ..... and ..... energies.
  - a. mechanical - sound - solar
  - b. mechanical - thermal - solar
  - c. mechanical - sound - thermal
  - d. sound - thermal - solar
- 4. The energy source in a toy car is the .....
  - a. engine.
  - b. tires.
  - c. battery.
  - d. fuel.
- 5. It takes several ..... for a spacecraft to travel from Earth to Mars.
  - a. seconds
  - b. minutes
  - c. days
  - d. months
- 6. Curiosity rover is designed to explore .....
  - a. Earth planet.
  - b. Mars planet.
  - c. the Sun.
  - d. the moon.

#### 2 Put (✓) or (X) :

- 1. Energy cannot be transformed from one form to another. ( )
- 2. We can convert the solar energy into different forms of energy. ( )
- 3. We can continue to move a toy car even after its battery runs out. ( )
- 4. Curiosity is a vehicle that travels across the surface of the planet Mars. ( )
- 5. Mars is located a few meters away from Earth. ( )
- 6. Without electrical energy, Mars rover curiosity cannot move or communicate with Earth. ( )

#### 3 Correct the underlined words :

- 1. The solar energy produced from the moon can be converted into different forms of energy. (.....)
- 2. Toy cars depend on fuel as a source of electrical energy. (.....)
- 3. Curiosity is a robotic vehicle that is designed to explore the surface of moon. (.....)



**4 Write the scientific term of each of the following :**

- 1. The source of energy in some toys that stores chemical energy. (.....)
- 2. The energy produced from batteries. (.....)
- 3. A robotic vehicle which is designed to explore the surface of Mars. (.....)

**5 Complete the following sentences :**

- 1. The energy can be ..... from one form to another.
- 2. Remote controlled toy cars changes ..... energy stored in its batteries into ..... energy that in turn changes into ..... energy which is used to move the car.
- 3. To operate an electric mixer we use ..... energy.
- 4. When your cell phone is out of charge, you must recharge its ..... to operate it again.
- 5. Some calculators can change solar energy into ..... energy by using the sunlight.
- 6. On Mars planet, Curiosity robot can be operated for a long period of time by using ..... energy from sunlight that is converted into ..... energy used to recharge its batteries.

**6 Give reasons for :**

- 1. A remote controlled toy car needs battery to move from one place to another.  
.....  
.....
- 2. Some calculators use the sunlight to be operated.  
.....  
.....
- 3. Mars rover Curiosity was operated for long period of time on Mars without any need to be recharged.  
.....  
.....

**7 What happens if ... ?**

- 1. The charge of remote controlled toy car batteries is running out.  
.....  
.....
- 2. Solar calculators were exposed to the sunlight.  
.....  
.....



3. Mars rover Curiosity didn't get any sunlight on Mars surface.

8 Look at the following figures, then put (✓) or (X):



car (1)



car (2)

1. The movement of the two cars can be controlled from a distance by using a remote control. ( )
2. Car (2) use sunlight to move. ( )
3. The two cars can convert the chemical energy stored in their batteries into electrical energy. ( )
4. We can use an electric cable to recharge the battery that is placed in car (1) again if it runs out. ( )



## Exercises on Lesson 2

### 1 Choose the correct answer :

1. In the hair dryer, the electrical energy changes into ..... and ..... energies.
  - a. sound – thermal
  - b. kinetic – light
  - c. thermal – light
  - d. light – sound
2. In the washing machine, the ..... energy changes into kinetic and sound energies.
  - a. light
  - b. electrical
  - c. thermal
  - d. potential
3. You feel warm when you rub your hands together, because ..... energy changes into thermal energy.
  - a. kinetic
  - b. light
  - c. electrical
  - d. sound
4. Plants can convert the light energy from the Sun into ..... energy which is stored inside the plant in the form of sugar.
  - a. sound
  - b. electrical
  - c. chemical
  - d. kinetic
5. When you eat an apple, your body converts the ..... energy stored inside the apple into ..... energy when you move.
  - a. chemical – electrical
  - b. kinetic – chemical
  - c. electrical – chemical
  - d. chemical – kinetic
6. Electric wires are made of .....
  - a. copper.
  - b. paper.
  - c. wood.
  - d. glass.
7. Which form of energy is not used or produced when you turn on an electric bulb ?
  - a. Electrical.
  - b. Light.
  - c. Thermal.
  - d. Sound.
8. When you use the hand bell, the ..... energy changes into sound energy.
  - a. light
  - b. thermal
  - c. kinetic
  - d. electric
9. Which sentence shows the energy changes in the flashlight in a correct order ?
  - a. Chemical → electrical → light.
  - b. Chemical → light → electrical.
  - c. Electrical → chemical → light.
  - d. Light → chemical → electrical.
10. If the ..... energy doesn't go through the electric fan's wire, it will not turn on.
  - a. sound
  - b. electrical
  - c. kinetic
  - d. thermal



**2 Put (✓) or (X) :**

- 1. In the soap dispenser, potential energy changes into kinetic energy. ( )
- 2. In the electric blender, sound energy changes into electrical energy and kinetic energy. ( )
- 3. Most of energy chains starts with the moon. ( )
- 4. Light energy from the Sun causes trees to grow. ( )
- 5. Both hair dryer and washing machine depend on the same kind of energy to be operated. ( )
- 6. In the electric power stations, the sound energy produced from burning of coal can be changed into electrical energy. ( )
- 7. There is energy loss when energy is transformed from one form to another. ( )
- 8. Energy can be destroyed inside some devices. ( )
- 9. Electric bulb depends on chemical energy to be operated. ( )
- 10. Both electric bulb and electric heater produce thermal energy. ( )

**3 Write the scientific term for each of the following :**

- 1. The energy produced from a battery. (.....)
- 2. The energy used to operate a television. (.....)
- 3. The main source of energy for most forms of energies on Earth. (.....)
- 4. The energy produced when the wood of trees is burned. (.....)
- 5. It is produced from the remains of dead trees buried under the Earth's surface over millions of years. (.....)
- 6. The energy that is used to operate an electric heater. (.....)
- 7. The energy stored inside the coal. (.....)

**4 Complete the following sentences :**

- 1. The energy that is produced from the battery used to operate a toy car is ..... energy.
- 2. When you press on the soap dispenser, you turn the ..... energy stored in its spring into ..... energy that moves the soap upward.
- 3. The energies that are produced from the washing machine are ..... energy and ..... energy.
- 4. When you rub your hands together, the ..... energy is converted into ..... energy.
- 5. In any energy chain, some of the energy is lost in the form of .....
- 6. The electric lamp converts electrical energy into ..... energy and ..... energy.
- 7. The ..... is the primary source of energy that is transferred to the food in the form of chemical energy.



**5 Give reasons for :**

- 1. When you press on the spring of soap dispenser, the soap moves upward.  
(according to the change of energy).  
.....
- 2. When you rub your hands together, you feel warmth.  
.....
- 3. Not all the energy that enters the energy chain reaches the device completely.  
.....

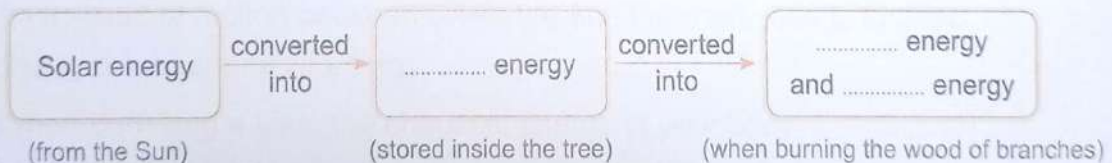
**6 What happens if ... ?**

- 1. You turn on the T.V  
(according to the change of energy).  
.....  
.....
- 2. You burn a piece of wood.  
(according to the change of energy).  
.....  
.....
- 3. You shake a small bell with your hand.  
(according to the change of energy).  
.....

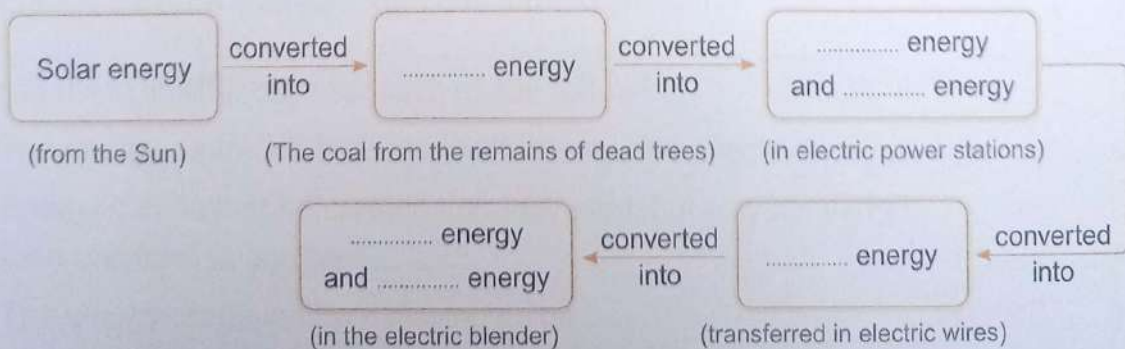
**7 Use the following words to complete the energy chains below. (you may use the same word more than once).**

(Thermal – Chemical – Kinetic – Electrical – Sound – Light)

1. The energy chain of burning some branches of a tree :






2. The energy chain of electric blender.





8 Choose from column (A) what suits it in both columns (B) and (C) :

(A) Energy used	(B) The device	(C) Energy Produced
1. Kinetic energy	a. 	A. Thermal energy.
2. Electrical energy	b. 	B. Chemical energy.
3. Solar energy	c. 	C. Sound energy.

1. .... → .....

2. .... → .....

3. .... → .....



### Exercises on Lesson 3

#### 1 Choose the correct answer :

- 1. In the electric water kettle, the electrical energy changes into ..... energy that can warm the cold water inside it.  
a. sound                      b. thermal                      c. light                      d. kinetic
- 2. While playing a guitar, the ..... energy changes into sound energy.  
a. kinetic                      b. light                      c. chemical                      d. potential
- 3. Inside a light bulb, electrical energy changes into ..... and ..... energies.  
a. sound – light                      b. sound – thermal  
c. kinetic – light                      d. light – thermal
- 4. When you turn on a light bulb, the electrical energy travels through ..... until reaching the bulb.  
a. wires                      b. glass                      c. wood                      d. plastic
- 5. Both hair dryer and electric water kettle produce ..... energy.  
a. chemical                      b. thermal                      c. light                      d. potential
- 6. Some kinetic energy is converted into ..... energy due to friction of bike's tire with the road.  
a. light                      b. electrical                      c. potential                      d. thermal

#### 2 Put (✓) or (X) :

- 1. There is a stored chemical energy inside the food we eat. (    )
- 2. As a result of friction between bike's tire and the road, kinetic energy changes into chemical energy. (    )
- 3. When pedalling a bike, the chemical energy in your body changes into kinetic energy. (    )
- 4. Energy can't be changed from one form to another. (    )

#### 3 Write the scientific term for each of the following :

- 1. The energy produced from the electric lamp and affects our eyes. (.....)
- 2. Energy can neither be created nor destroyed, but only converted from one form to another. (.....)
- 3. The energy produced from playing guitar. (.....)
- 4. The energy used to play a drum. (.....)



#### 4 Complete the following sentences :

1. When you ride a bicycle, the ..... energy stored in your body is converted into ..... energy which causes the bicycle to move.
2. Some kinetic energy of the bicycle is converted into ..... energy due to the friction of its tires with the road.
3. The electric lamp converts ..... energy into light energy and ..... energy.
4. The change of electrical energy into sound energy in the radio is an example that proves the law of .....
5. Energy can neither be ..... nor ..... , but only ..... from one form to another.

#### 5 Give reasons for :

1. You feel heat, when you put your hands near a lighted electric lamp.

2. The presence of batteries inside a toy car.

#### 6 What happens if you put your hands near the lighted lamp ?

#### 7 Look at the following figures, then complete the following sentences :

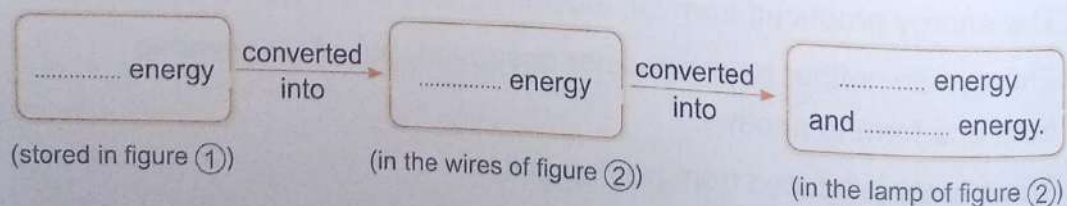


Figure (1)



Figure (2)

1. Figure (1) converts ..... energy into ..... energy.
2. Figure (2) converts ..... energy into ..... energy and ..... energy.
3. The energy chain that is produced due to inserting figure (1) inside figure (2) and turning it on is :





## Exercises on Lessons 4 & 5

### 1 Choose the correct answer :

- 1. The input energy when using the hair dryer is the ..... energy.
  - a. electrical
  - b. potential
  - c. kinetic
  - d. thermal
- 2. Which of the following forms of energy is not considered an example of output energy when hair dryer is used ? .....
  - a. Kinetic energy.
  - b. Electrical energy.
  - c. Thermal energy.
  - d. Sound energy.
- 3. During charging a mobile phone, the ..... energy is converted into ..... energy that is stored in the phone battery.
  - a. electrical – chemical
  - b. chemical – thermal
  - c. electrical – thermal
  - d. thermal – chemical
- 4. Sound and ..... energies are from output energies when operating the mobile phone.
  - a. electrical
  - b. potential
  - c. chemical
  - d. light
- 5. The output energy when playing drums is the ..... energy.
  - a. chemical
  - b. light
  - c. sound
  - d. potential
- 6. The produced ..... energy does not help the blender do its job.
  - a. chemical
  - b. sound
  - c. light
  - d. potential
- 7. When a piece of coal is burnt, ..... energy is produced.
  - a. thermal
  - b. kinetic
  - c. sound
  - d. potential
- 8. During the running of a player, the chemical energy inside his body is converted into ..... and ..... energies.
  - a. potential – light
  - b. kinetic – light
  - c. thermal – kinetic
  - d. thermal – light

### 2 Put (✓) or (X) :

- 1. Energy may be destroyed inside different devices. ( )
- 2. Some of the converted energy does not help some devices do the function for which it was designed. ( )



- 3. The produced sound energy helps the hair dryer to do its function. ( )
- 4. The input energy in a hair dryer is the chemical energy. ( )
- 5. The energy chain of a burning candle is : 

Chemical energy
-----------------

 $\xrightarrow{\text{converted into}}$ 

Thermal energy and light energy
---------------------------------

 ( )
- 6. In waterfalls, the water that falls down has a kinetic energy. ( )

### 3 Write the scientific term of each of the following :

- 1. The energy that is stored in both batteries and food. (.....)
- 2. The energy that is produced from the electric power stations and flows through wires. (.....)
- 3. A kind of energy that is produced from the electric heater and burning coal. (.....)
- 4. The energy that is produced from the blender and helps it in doing its job. (.....)
- 5. The wasted energy when using a mobile phone for a long time. (.....)

### 4 Complete the following sentences :

- 1. The mobile phone converts chemical energy stored in its battery into ..... energy and ..... energy, and by using it for a long time, some energy is lost in the form of ..... energy.
- 2. The input energy of a hair dryer is ..... energy, while the output energies of a hair dryer are ..... energy, ..... energy and ..... energy.
- 3. The wasted energies that are produced from a washing machine are ..... energy and ..... energy.
- 4. The main function of a blender is done by the help of ..... energy.
- 5. The input energy in an electric bulb is ..... energy, while the output energies of it are ..... energy and also ..... energy which doesn't help in its main function.
- 6. The input energy when recharging a mobile phone is ..... energy which is stored in the form of ..... energy inside the phone battery.
- 7. In the electric heater, ..... energy is considered as an input energy, while thermal energy is considered as ..... energy.
- 8. The kinetic energy in a hand bell is considered as ..... energy, while in an electric fan is considered as ..... energy.



**5 Give reasons for :**

- 1. Thermal energy in mobile phone is considered as a wasted energy.  
.....  
.....
- 2. The electrical energy that is entered the hair dryer isn't come out of the hair dryer in the same form of energy.  
.....  
.....
- 3. Sound energy and thermal energy are considered as wasted energy in the blender.  
.....  
.....

**6 What happens if ... ?**

- 1. You use a mobile phone for a long time. (according to the wasted energy).  
.....  
.....
- 2. You turn on an electric fan. (according to the change of energy).  
.....  
.....

**7 Look at the following figures, then complete the following energy chain :**

Figure (1)



Figure (2)

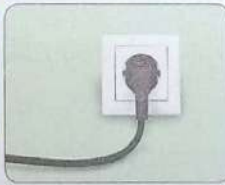


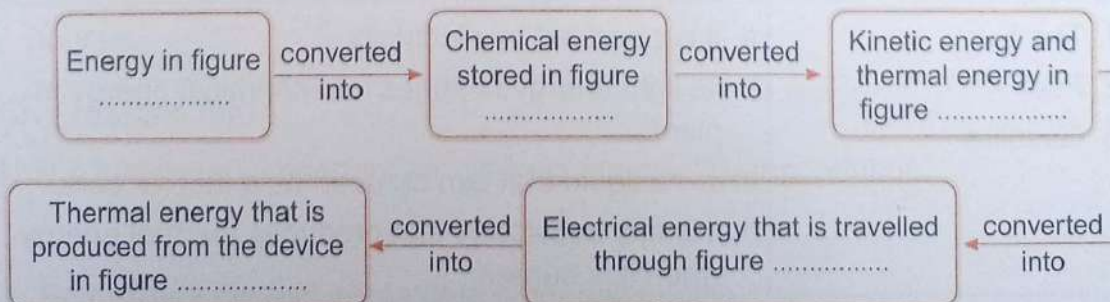
Figure (3)



Figure (4)



Figure (5)





# Exercises

## on Lessons of Concept (3.2)

● Understand

● Apply

● Analyze

● Evaluate

● Create

### Exercises on Lesson 1

#### 1 Choose the correct answer :

1. Among forms of fuel that present in car fuel stations are .....
  - a. gasoline and wood.
  - b. natural gas and coal.
  - c. wood and coal.
  - d. gasoline and natural gas.
2. All the following are found deeply under the Earth's surface, except .....
  - a. natural gas.
  - b. coal.
  - c. green plants.
  - d. oil.
3. When the speedometer of a moving car refers suddenly to zero, this may be due to all the following situations, except .....
  - a. gasoline is completely run out.
  - b. the battery is completely damage.
  - c. the driver presses the brake pedal.
  - d. the driver presses the gasoline pedal.
4. The opposite figure represents the fuel indicator, which referes to that the fuel tank .....
  - a. is completely empty from gasoline.
  - b. is completely full of gasoline.
  - c. has half amount of gasoline.
  - d. has half amount of water.
5. We can use the energy obtained from burning of wood in all of the following situations, except .....
  - a. warming houses.
  - b. operating television.
  - c. cooking food.
  - d. boiling water.



#### 2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. The Sun	a. it is operated by electricity.
2. Fuel	b. its light energy changes into chemical energy in plants.
3. Gasoline	c. it is a liquid that can be used as a fuel for cars.
	d. it is any substance that produces thermal energy when it is burned.

1. ....

2. ....

3. ....



**3 Put (✓) or (X) :**

- 1. As the speed of the car increases, the amount of used fuel decreases. ( )
- 2. It is better before making a trip by a car, we must check the amount of gasoline in the fuel tank. ( )
- 3. You need gasoline to move a bicycle. ( )
- 4. Both coal and wood produce energy on burning them. ( )
- 5. We cannot drive a car that doesn't contain fuel. ( )

**4 Correct the underlined words :**

- 1. We need sound energy, for cooking foods and warming houses. (.....)
- 2. The moon is the main source of most energies on the Earth's surface. (.....)
- 3. Fuel is the substance that produces electrical energy on burning. (.....)

**5 Write the scientific term of the following :**

- 1. It is the main source of most forms of energy on the Earth's surface. (.....)
- 2. The form of energy that is produced as a result of burning of wood and coal. (.....)
- 3. It is any substance which produces thermal energy on burning. (.....)

**6 Complete the following sentences :**

- 1. Gasoline burns inside a car engine to produce ..... energy that is changed into ..... energy which causes the movement of the car.
- 2. Some forms of fuel can be used in cooking such as ..... , ..... and .....
- 3. Coal, ..... and ..... can be used in electric power stations to generate electricity.
- 4. We can use some forms of fuel such as ..... and ..... in warming houses.

**7 Give reasons for :**

- 1. The fuel is very important for different means of transportation.  
.....
- 2. Sometimes the fuel indicator of a car goes down.  
.....



- 3. Gasoline burns inside a car engine.

### 8 What happens if ... ?

- 1. The amount of gasoline in a car decreases (according to the car fuel indicator).
- 2. Fuel runs out in a car (according to the car movement).

### 9 Look at the opposite photo, then choose the correct answer :

- 1. Coal is a type of fuel, which is used in all the following purposes, except .....
  - a. cooking food.
  - b. skating on ice.
  - c. generating electricity.
  - d. warming houses.
- 2. Coal burns to produce .....
  - a. thermal energy.
  - b. sound energy.
  - c. natural gas.
  - d. wood of trees.
- 3. Coal and ..... are used in warming houses.
  - a. water
  - b. plastic
  - c. sand
  - d. wood



Burning coal



## Exercises on Lesson 2

### 1 Choose the correct answer :

- 1. All the following are forms of fuel, except .....  
 a. wood.                      b. natural gas.                      c. gasoline.                      d. glass.
- 2. .... is considered as the main resource of energy on the Earth's surface.  
 a. Gasoline                      b. The Sun                      c. Natural gas                      d. The moon
- 3. All the following are renewable resources of energy, except .....  
 a. natural gas.                      b. water.                      c. the Sun.                      d. wind.
- 4. The non-renewable resources of energy, take ..... to be formed.  
 a. a short period of time                      b. a very long period of time  
 c. few minutes                      d. few hours
- 5. Ancient people use ..... as a form of fuel, before discovering gasoline.  
 a. electricity                      b. water                      c. wind                      d. wood
- 6. Wood is considered as .....  
 a. biofuel.                      b. fossil fuel.                      c. liquid fuel.                      d. gaseous fuel.
- 7. Coal is formed under the Earth's surface from the remains of .....  
 a. dead animals.                      b. dead plants.  
 c. dead humans.                      d. dead insects.
- 8. Extreme heat and pressure under the Earth's surface has an important role in forming .....  
 a. wood.                      b. wind.                      c. fossil fuel.                      d. biofuel.

### 2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Water	a. it needs extreme heat and pressure to be formed from remains of dead plants.
2. Wind energy	b. it is the main resource of energy on the Earth's surface.
3. Coal	c. it is a gaseous renewable resource of energy.
	d. it is a liquid renewable resource of energy.

1. ....

2. ....

3. ....



**3 Put (✓) or (X) :**

- 1. Biofuel is one of non-renewable resources of energy. ( )
- 2. Extreme cooling under the Earth's surface, helps in the formation of oil. ( )
- 3. Water and gasoline are two renewable resources of energy. ( )
- 4. We have to reduce the usage of the Sun as a source of energy. ( )
- 5. The consumption of oil is slower than its formation under the Earth's surface. ( )
- 6. The Sun is the primary source of forming both biofuel and fossil fuel. ( )
- 7. We can make a liquid fuel from grass and wood chips. ( )

**4 Correct the underlined words :**

- 1. We have to increase planting vegetables and fruits that need a large amount of water. (.....)
- 2. In houses, gasoline is used in cooking foods as it is one of the oldest known biofuels. (.....)
- 3. The non-renewable resources of energy take a short period of time to be formed under the Earth's surface. (.....)
- 4. The moon is the primary source of both biofuel and fossil fuel. (.....)
- 5. We can use some animals, to make a liquid biofuel. (.....)
- 6. The rate of consumption of fossil fuel, must be increased. (.....)
- 7. Wood is a form of fossil fuel, that can be used in houses. (.....)
- 8. Water is a non-renewable resource of energy, that can be used as a fuel in cooking foods and in moving cars. (.....)

**5 Write the scientific term of each of the following :**

- 1. Natural resources of energy, that take a short period of time to be renewed. (.....)
- 2. Natural resources of energy, that take a very long period of time to be formed. (.....)
- 3. It is a form of biofuel, that can be made from some types of plants such as grass and wood chips. (.....)
- 4. They are fuels that are produced from remains of dead animals and plants under the Earth's surface. (.....)
- 5. It is a type of fossil fuel that is produced from remains of dead plants under the effect of extreme heat and pressure. (.....)
- 6. It is a type of fossil fuel that is produced from dead marine animals. (.....)



**6 Complete the following sentences :**

- 1. Water and ..... are considered from ..... resources of energy, while coal and ..... are from non-renewable resources of energy.
- 2. The natural resources that can be replaced shortly after being used are called ..... resources of energy.
- 3. The natural resources that are consumed at a rate faster than they can be renewed are called ..... resources of energy.
- 4. Different forms of fuel can be classified into two main types which are ..... and .....
- 5. The type of fuel that is produced from living organisms that can be planted is called ..... such as wood and .....
- 6. Wood and ..... are examples of biofuel, while ..... and ..... are examples of fossil fuel.
- 7. Wood chips and grass can be used to make a ..... biofuel.

**7 Give reasons for :**

- 1. Water and wind are considered as renewable resources of energy.  
.....
- 2. Coal and gasoline are considered as non-renewable resources of energy.  
.....
- 3. Using wood of trees as a fuel has negative effects on the environment.  
.....

**8 What happens if ... ?**

- 1. People increase using the wood of trees as a source of fuel.  
.....  
.....
- 2. The remains of dead living organisms were buried under the Earth's surface over millions of years.  
.....  
.....
- 3. Decomposition of remains of marine animals under the Earth's surface.  
.....  
.....



**9 Read the following paragraph, then choose the correct answer :**

Nowaday, we use gasoline and natural gas in means of transportation which are considered fossil fuels, while we can use coal which is a fossil fuel and also wood which is a biofuel in warming our houses.

1. .... is a non-renewable resource of energy, that is considered as a fossil fuel and it is not used in means of transportation nowaday.
  - a. Water
  - b. Coal
  - c. Wind
  - d. Gasoline
2. A type of biofuel, which is used in warming houses and cooking food is .....
  - a. wood.
  - b. wind.
  - c. water.
  - d. sand.
3. A type of fossil fuel, which is formed from decomposition of plant remains is .....
  - a. wood.
  - b. sand.
  - c. wind.
  - d. coal.



### Exercises on Lesson 3

#### 1 Choose the correct answer :

- 1. Remains of living organisms that were buried under the Earth's surface must be affected by ..... to form fossil fuel.
  - a. low pressure and high temperature
  - b. high pressure and low temperature
  - c. low pressure and low temperature
  - d. high pressure and high temperature
- 2. All the following factors play an important role in the formation of fossil fuel, except .....
  - a. extreme pressure.
  - b. extreme heat.
  - c. The moon light.
  - d. rocks and sediment.
- 3. All forms of fossil fuel are formed .....
  - a. above the Earth's surface.
  - b. under the Earth's surface.
  - c. above the water surface.
  - d. in the air around us.
- 4. All the following are forms of fossil fuel, except .....
  - a. water.
  - b. coal.
  - c. natural gas.
  - d. oil.
- 5. Which of the following forms of fuels can be manufactured by man ? .....
  - a. Oil and natural gas.
  - b. Oil and charcoal.
  - c. Natural gas and ethanol.
  - d. Charcoal and ethanol.
- 6. The steps of forming fossil fuel, don't include ..... of the remains of the living organisms.
  - a. decaying
  - b. cooling
  - c. burying
  - d. heating
- 7. We can use the energy that is produced from ..... to generate electrical energy.
  - a. renewable resources only
  - b. non-renewable resources only
  - c. renewable and non-renewable resources
  - d. food including fruits and vegetables
- 8. Hydroelectric energy is generated from .....
  - a. waterfalls only.
  - b. waterfalls and dams.
  - c. biofuel only.
  - d. biofuel and fossil fuel.



- 9. All the following actions don't conserve electrical energy, except .....
  - a. unplugging unused electrical appliances.
  - b. plugging many unused electrical appliances.
  - c. turning on all the house lights all the day long.
  - d. leaving the television turned on all the day long.
- 10. All the following are used to generate electrical energy, except .....
  - a. oil.
  - b. natural gas.
  - c. waterfalls.
  - d. rain water.
- 11. Inside the electric power station, heating of ..... produces steam.
  - a. turbines
  - b. generators
  - c. water
  - d. fuel

## 2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Rocks and sediment	a. is a liquid fossil fuel, that is used to produce electricity.
2. Water	b. is a liquid biofuel, that is used to produce thermal energy in houses.
3. Oil	c. is a liquid in electric power station that on heating it produces steam which turns turbines.
	d. play an important role in the formation of fossil fuel.

1. ....

2. ....

3. ....

## 3 Put (✓) or (X) :

- 1. Any form of fossil fuel must be formed under the Earth's surface. ( )
- 2. Oil, natural gas and coal can be used to produce hydroelectric energy. ( )
- 3. Turning off lights that we do not need, is a way to conserve electricity. ( )
- 4. Burning of fossil fuel inside electric power station produces potential energy. ( )
- 5. The movement of a generator in electric power station produces potential energy. ( )
- 6. We have to conserve all forms of fuel. ( )



**4 Correct the underlined words :**

1. Fossil fuel include oil, coal and wood. (.....)
2. After death of living organisms, their remains are buried under the Earth's surface and exposed to extreme pressure and cool. (.....)
3. Hydroelectric energy, is one of non-renewable energy resources. (.....)
4. In electric power station, water turns turbines that produce kinetic energy. (.....)
5. The movement of generator in the electric power station changes potential energy into kinetic energy. (.....)

**5 Write the scientific term of each of the following :**

1. The type of fuel that is used inside the electric power station to produce electricity. (.....)
2. The device in the electric power station, that produces kinetic energy to operate generators. (.....)
3. The matter that produces steam on heating, which is used to turn turbines in electric power station. (.....)
4. The device in the electric power station, that turns kinetic energy into electrical energy. (.....)

**6 Complete the following sentences :**

1. In electric power station, we use fossil fuel such as oil and natural gas which are considered as ..... resources of energy.
2. The hydroelectric energy is considered as ..... resource of energy, and we can get it from ..... and dams to generate electricity.
3. When fuel is burned in an electric power station, it produces ..... energy to heat water.
4. The electric generator changes ..... energy into ..... energy.
5. During generating electricity in electric power stations, the hot water produces ..... which is used to turn turbines.
6. Turbines in electric power stations are turned by steam and they produce ..... energy to run the ..... of the electric power stations.
7. Inside electric power stations, the burning of fuel produces ..... energy, while the movement of turbines produces ..... energy.



**7 Give reasons for :**

- 1. The importance of generators in electric power stations.  
.....
- 2. We must turn off lights that we are not needed for a while.  
.....

**8 What happens if ... ?**

- 1. There is a damage happens in a turbine connected to a generator in an electric power station.  
.....  
.....
- 2. The water in an electric power station not heated.  
(according to the run of the turbine).  
.....

**9 Look at the opposite photo, then choose the correct answer according to your studying of how electric power stations work :**

1. To generate electricity inside electric power stations, we ..... the fuel.
  - a. cool
  - b. mix water with
  - c. burn
  - d. mix sand with
2. The steam in electric power station is produced as a result of .....
  - a. heating the water.
  - b. mixing the water with fuel.
  - c. cooling the water.
  - d. cooling the fuel.
3. During the steps of generating electricity inside electric power stations, ..... is the first type of energy which is produced from burning of fuel.
  - a. electrical energy
  - b. thermal energy
  - c. potential energy
  - d. hydroelectric energy
4. The electric generator changes ..... energy into ..... energy.
  - a. electrical – kinetic
  - b. electrical – thermal
  - c. thermal – electrical
  - d. kinetic – electrical
5. The movement of turbines produces ..... energy.
  - a. kinetic
  - b. potential
  - c. chemical
  - d. hydroelectric



Electric power station



**10 Put (✓) in front of sentences which describe conservation of electricity :**

- 1. Turning off lights you will not need for a while. ( )
- 2. Let electrical appliances (devices) work all the time. ( )
- 3. Using energy-saving light bulbs. ( )
- 4. Leaving television turned on all the day long. ( )

**11 Arrange the following steps to show how electricity is generated in electric power station and sending it to houses and factories :**

- (.....) Steam turns turbines that produce kinetic energy.
- (.....) Fuel burns and produces thermal energy.
- (.....) Electrical energy sent to houses and factories.
- (.....) Water becomes hot and produces steam.
- (.....) Turbines turn generator that produces electrical energy.



1 Choose the correct answer :

- 1. Air pollution is usually caused due to ..... of fuel.  
 a. cooling                      b. warming                      c. freezing                      d. burning
- 2. To decrease the pollution in a city to its lowest limit, we have to build a factory .....  
 a. that uses oil, inside the city.  
 b. that uses coal, inside the city.  
 c. that uses natural gas, outside the city.  
 d. that uses coal, outside the city.
- 3. Cars smog cause irritation of ..... of humans.  
 a. stomach and eyes                      b. eyes and lungs  
 c. small intestine                      d. large intestine
- 4. Cars smog contain tiny particles that .....  
 a. damage the tissue of human respiratory system.  
 b. damage the tissue of human digestive system.  
 c. help the human body grow up.  
 d. keep the human body healthy.
- 5. To reduce pollution of cars smog, we have to operate cars by .....  
 a. gasoline or natural gas.  
 b. gasoline or electricity.  
 c. electricity or natural gas.  
 d. gasoline or coal.
- 6. Acid rain is formed when ..... combines with rain water.  
 a. oxygen gas  
 b. carbon dioxide gas  
 c. dust  
 d. sand
- 7. All the following are harmful effects of acid rain, except .....  
 a. global warming.  
 b. death of trees.  
 c. chemical changes in lakes.  
 d. chemical changes in the soil.



**2 Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. Oxygen gas	a. it is a liquid that is considered as non-renewable resource of energy.
2. Carbon dioxide gas	b. it is a gas that is necessary for respiration of living organisms.
	c. it is a gas that causes trapping heat above the Earth's surface when it increases in air.

1. ....

2. ....

**3 Put (✓) or (X) :**

- 1. Rain water can be mixed with both pesticides and carbon dioxide gas. ( )
- 2. Cars smog don't cause any tissue damage to the human respiratory system. ( )
- 3. Acid rain causes soil and water pollution. ( )
- 4. Global warming increases the decomposition of some rocks. ( )
- 5. The heat trapped above the Earth's surface causes global warming. ( )
- 6. Acid rain helps trees to survive. ( )
- 7. To reduce pollution and preserve non-renewable resources of energy, we must decrease their using. ( )

**4 Write the scientific term of each of the following :**

- 1. It is an acid that is formed on mixing carbon dioxide gas with water. (.....)
- 2. It is a phenomenon in which the Earth's temperature increases, when carbon dioxide gas increases in the air. (.....)
- 3. It is the system that its tissue is damaged due to breathing big amount of cars smog. (.....)
- 4. It is a type of rain that is formed when carbon dioxide gas combines with water in the air. (.....)

**5 Complete the following sentences :**

- 1. When pesticides mix with water in canals, this causes the pollution of ..... and .....
- 2. Factories may cause the pollution of ..... , ..... and ..... due to the chemicals they use.



- 3. Cars smog lead to ..... pollution that causes irritation of ..... and ..... of humans.
- 4. Tiny particles found in ..... lead to air pollution that causes tissue damage of the human ..... system.
- 5. Coal and oil burning produce ..... gas, which combines with ..... in air forming ..... acid resulting in acid rain.
- 6. Increasing the burning of fossil fuel produces more ..... gas that causes ..... pollution.
- 7. Acid rain leads to chemical changes in the structure of lakes causing death of .....
- 8. Burning of coal and oil produce ..... gas which forms a layer in the atmospheric air causing ..... phenomenon.
- 9. Chemical changes in the structure of ..... due to ..... rain lead to the death of trees.

#### 6 Give reasons for :

- 1. Smog of cars are very dangerous to human health.  
.....  
.....
- 2. Farmers must decrease using of pesticides.  
.....  
.....
- 3. Increase the burning of fossil fuel causes acid rain.  
.....  
.....
- 4. Global warming occurs due to the increase of burning of coal and oil.  
.....  
.....
- 5. Acid rain has a bad effect on buildings in cities.  
.....  
.....

#### 7 What happens if ... ?

- 1. Mixing pesticides with water of canals and rivers. (according to the pollution)  
.....
- 2. Factories decrease using of chemicals. (according to the pollution)  
.....



3. Falling of acid rain on buildings for a long period of time.

4. People decrease burning of fossil fuel. (according to the amount of carbon dioxide)

**8** Look at the following graph that describes the percentage of cars smog in four different cities during one month, then choose the correct answer :

1. People in city number ..... have the most percentage of eyes' diseases.

- a. ①                      b. ②  
c. ③                      d. ④

2. City number ..... has the least percentage of air pollution.

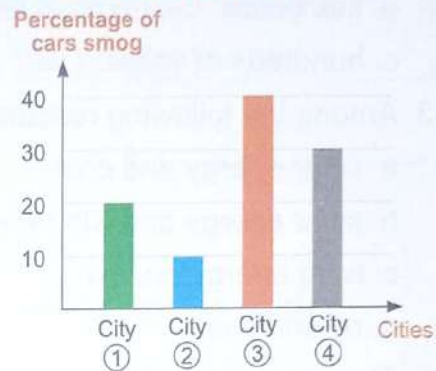
- a. ①                      b. ②  
c. ③                      d. ④

3. The most city that needs to change the type of fuel to decrease the air pollution in it, is city number .....

- a. ①                      b. ②                      c. ③                      d. ④

4. People suffer from respiratory system diseases in city number ..... are less than in city number ①.

- a. ①                      b. ②                      c. ③                      d. ④





## Exercises on Lessons

5 &amp; 6

## 1 Choose the correct answer :

- 1. We must ..... fossil fuel at first, to obtain energy.  
a. wash                      b. cook                      c. cool                      d. burn
- 2. Fossil fuels need ..... to be formed under the Earth's surface.  
a. five years                      b. ten years  
c. hundreds of years                      d. millions of years
- 3. Among the following resources, we must conserve .....  
a. solar energy and coal.  
b. solar energy and wind energy.  
c. wind energy and oil.  
d. oil and coal.
- 4. To conserve fossil fuels, we have to do all the following actions, except .....  
a. replacing gasoline with natural gas.  
b. replacing gasoline with solar energy.  
c. replacing natural gas with solar energy.  
d. replacing coal with wind energy.
- 5. Burning of fossil fuel produces gases that .....  
a. help human to respire.  
b. help animals survive.  
c. pollute the air.  
d. benefit the environment.
- 6. Burning all the following forms of fuel causes increasing the temperature of the Earth, except .....  
a. solar energy.                      b. coal.                      c. oil.                      d. wood.
- 7. All the following sentences are related to the global warming phenomenon, except .....  
a. changing the Earth's climate.                      b. trapping heat in the atmosphere.  
c. decreasing the Earth's temperature.                      d. increasing the Earth's temperature.
- 8. Both coal and charcoal .....  
a. are renewable resources of energy.  
b. are non-renewable resources of energy.  
c. are examples of biofuel.  
d. produce thermal energy on burning.



**2 Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. Wood	a. it is one of renewable resources of energy, which don't pollute the air.
2. Coal	b. it is one of biofuel, that is used in warming houses.
3. Wind energy	c. it is one of biofuel, that is produced from corn.
	d. it is one of fossil fuel, that pollutes the air.

1. ....

2. ....

3. ....

**3 Put (✓) or (X) :**

- 1. The amount of oil on the Earth is limited. ( )
- 2. Fossil fuels that human made from corn cannot be replaced as quickly as it is consumed. ( )
- 3. When burning of fossil fuel increases, the temperature on Earth decreases. ( )
- 4. As a result of global warming, the temperature on the Earth increases. ( )
- 5. The use of fossil fuel to produce energy is more expensive than using renewable resources. ( )
- 6. Wind energy will run out faster than natural gas. ( )
- 7. To conserve fossil fuel, we have to replace it with renewable resources of energy. ( )
- 8. Global warming is one of the disadvantages of using fossil fuels in energy production. ( )

**4 Correct the underlined words :**

- 1. The amounts of renewable resources of energy are limited on Earth. (.....)
- 2. The amount of biofuel that is consumed, cannot be replaced as quickly as it is used. (.....)
- 3. Gases emitted from burning fossil fuel always clear the air. (.....)
- 4. Burning of all types of fuel causes global warming. (.....)
- 5. Non-renewable resources of energy will not run out, as they are used. (.....)
- 6. Wood is one of fossil fuel that is used in warming houses. (.....)
- 7. Gases emitted from fossil fuel on burning decrease the temperature on Earth. (.....)



**5 Write the scientific term of each of the following :**

- 1. The type of fuel that burns producing harmful gases which pollute the air. (.....)
- 2. The phenomenon that causes the increase of the temperature on the Earth, as a result of burning of more fossil fuels. (.....)
- 3. The energy resources that include wind energy, water and solar energy. (.....)

**6 Complete the following sentences :**

- 1. To conserve fossil fuel, we can replace it with renewable resources of energy such as water , ..... and .....
- 2. Global warming is a phenomenon that raises the ..... of Earth and changes its .....
- 3. When fossil fuel is burned, it emits ..... that cause air pollution and ..... trapping in atmosphere.
- 4. If people do not rationalize the consumption of ..... fuel, it will run out on Earth.
- 5. Using the ..... resources of energy is more expensive than using fossil fuel.
- 6. To avoid air pollution, we must use ..... resources of energy such as water, ..... energy and ..... energy.

**7 Give reasons for :**

- 1. The used amount of fossil fuel cannot be replaced as quickly as it is consumed.  
.....  
.....
- 2. To keep the air clean we must replace fossil fuel with renewable resources of energy.  
.....  
.....

**8 What happens if ... ?**

- 1. People don't rationalize their using of fossil fuel.  
.....  
.....
- 2. Using renewable resources of energy instead of fossil fuel.  
(according to Earth's temperature)  
.....  
.....



**9 Give one example for each of the following :**

1. A renewable resource of energy : .....
2. A non-renewable resource of energy : .....
3. A method of conserving fossil fuel : .....
4. A disadvantage of using fossil fuel in energy production : .....
5. An advantage of using renewable resources to produce energy : .....

**10 The different forms of fossil fuel are considered as resources of energy on Earth that have some disadvantages.**

**Choose the correct answer in the following questions :**

1. If we don't rationalize using of fossil fuel, its amount will .....
  - a. not change on the Earth.
  - b. increase on the Earth.
  - c. be constant on the Earth.
  - d. run out on the Earth.
2. To conserve fossil fuel, we must do all the following actions, except .....
  - a. using energy-saving light bulbs.
  - b. using fossil fuel more than solar energy.
  - c. using bikes more than cars.
  - d. using renewable resources of energy more than fossil fuel.
3. Fossil fuel is characterized by all the following except .....
  - a. it has limited amount.
  - b. it produces thermal energy on burning.
  - c. it is a renewable resource of energy.
  - d. it is a non-renewable resource of energy.
4. All the following resources are considered non-renewable resources of energy except .....
  - a. charcoal.
  - b. natural gas.
  - c. coal.
  - d. oil.



# Exercises

## on Lessons of Concept (3.3)

● Understand

● Apply

● Analyze

● Evaluate

● Create

### Exercises on Lesson 1

#### 1 Choose the correct answer :

- 1. All of the following are examples of renewable energy resources, except .....
  - a. fossil fuel.
  - b. waterfalls.
  - c. wind.
  - d. sunlight.
- 2. Solar panels use solar energy to generate ..... energy which is used in lighting houses.
  - a. sound
  - b. electrical
  - c. potential
  - d. kinetic
- 3. The wind movement has ..... energy which moves the windmill's blades.
  - a. kinetic
  - b. solar
  - c. thermal
  - d. potential
- 4. Both modern wind turbines and old windmills are similar in their .....
  - a. shape.
  - b. ability to generate electrical energy.
  - c. blades number.
  - d. ability to generate potential energy.
- 5. Some types of lamps depend on ..... as a renewable energy resource in order to do its function.
  - a. sunlight
  - b. oil
  - c. coal
  - d. natural gas
- 6. Gasoline is a non-renewable energy resource that is used inside a .....
  - a. flashlight.
  - b. car engine.
  - c. electric fan.
  - d. washing machine.

#### 2 Put (✓) or (X) :

- 1. Windmill turbines generate electricity by using the energy of water flow. ( )
- 2. Machines make our life more easier. ( )
- 3. The low cost of the energy used in watermills is from the disadvantages of using this energy. ( )
- 4. Windmills can do their job all the time as the wind never stops blowing. ( )
- 5. Both wind movement and water flow has kinetic energy. ( )
- 6. Both modern wind turbines and old windmills are used to generate electricity. ( )
- 7. All devices need energy to do their functions. ( )



**3 Correct the underlined words :**

1. Solar panels use sound energy to generate electricity. (.....)
2. Watermill turbines generate electricity by using the energy of wind movement. (.....)
3. Manual mixer depends on electricity to do its function. (.....)
4. The high cost of producing energy in windmills is one of its advantages. (.....)

**4 Write the scientific term of each of the following :**

1. A mill that is turned by water flow. (.....)
2. A mill that is operated by wind movement. (.....)
3. Main energy which is produced from both electric mixer and manual mixer. (.....)
4. A type of energy resource when oil is used inside a car engine. (.....)

**5 Complete the following sentences :**

1. In electric power stations, the burning coal produces ..... energy to generate electricity, while turbines of ..... generate electricity by using the wind energy.
2. The water flow generates kinetic energy, which moves the ..... of watermills to transform this energy into ..... energy.
3. Both ..... and ..... are used to grind grains to make flour hundreds of years ago, but now we use them to generate .....
4. Although modern wind turbines and old windmills vary in shape, both of them can be used to generate .....
5. The flashlight uses battery which is ..... energy resource, but solar vehicles use solar panels which is ..... energy resource.
6. The electricity that is generated by water turbines is considered as ..... energy resource, while the electricity that is generated by burning of fossil fuel is considered as ..... energy resource.

**6 Give reasons for :**

1. Humans use windmills and watermills from hundreds of years ago.  
.....
2. Nowadays scientists work on inventing solar cars instead of fossil fuel cars.  
.....







- 3. The electricity that is generated by windmills is considered as renewable energy resource.

### 7 What happens if ... ?

1. The wind doesn't blow in an area that contains many modern windmills.
2. Sunlight falls on solar panels of some streetlights.

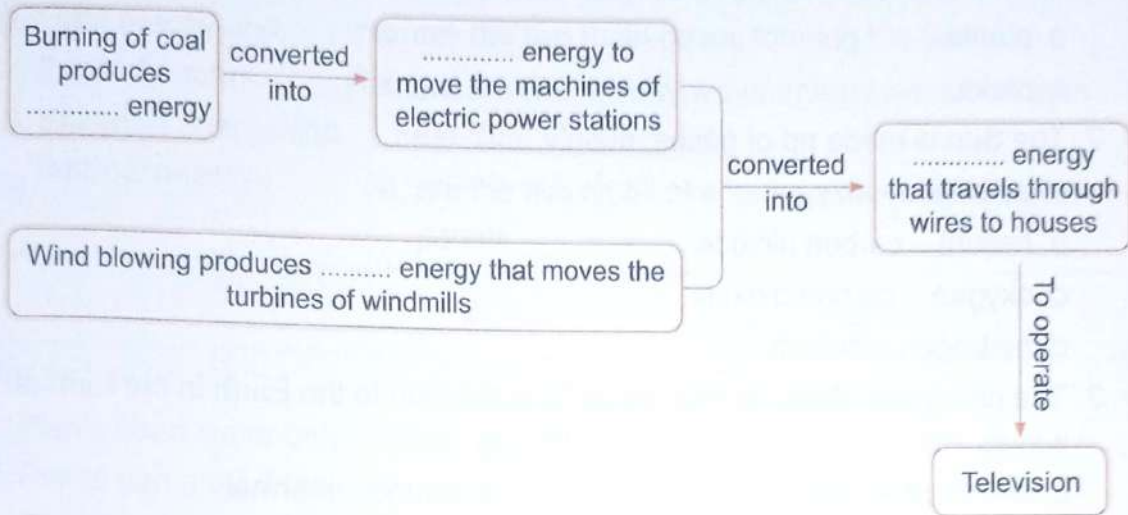
### 8 Put (✓) in front of each of the following examples to show the type of used energy resource in each :

Example	Renewable energy resource	Non-renewable energy resource
1. 		
2. 		
3. 		
4. 		



- 9 Complete the following energy chain by using the energies below  
(you may use each word more than once) :

(thermal – electrical – kinetic)





## Exercises on Lesson 2

## 1 Choose the correct answer :

1. In the absence of sunlight, all the following items will be affected, except .....
  - a. plants.
  - b. human.
  - c. rocks.
  - d. animals.
2. The Sun is made up of gases, mainly ..... and .....
  - a. hydrogen – oxygen.
  - b. helium – carbon dioxide.
  - c. oxygen – carbon dioxide.
  - d. hydrogen – helium.
3. The two types of energy that move from the Sun to the Earth in the form of waves are ..... energy and ..... energy.
  - a. electrical – light
  - b. sound – thermal
  - c. thermal – chemical
  - d. light – thermal
4. When land and water areas on Earth absorb the solar energy, the ..... increases.
  - a. temperature on Earth
  - b. speed of rotation of Earth
  - c. speed of rotation of moon
  - d. speed of rotation of Sun
5. The solar energy is converted into ..... energy in greenhouses.
  - a. electrical
  - b. sound
  - c. thermal
  - d. potential
6. Greenhouses allow farmers to plant crops that only grow in .....
  - a. polar climate.
  - b. warm climate.
  - c. absence of sunlight.
  - d. absence of water.
7. Using curved ..... sheets in cooking food is one of the benefits of using the solar energy.
  - a. paper
  - b. plastic
  - c. mirror
  - d. wooden
8. All the following are from the uses of electricity generated by solar panels except .....
  - a. operating windmills.
  - b. operating irrigation equipment.
  - c. lighting streets.
  - d. operating calculators.



**2 Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. Hydrogen and helium	a. are two gases involved in respiration process.
2. Light energy and thermal energy	b. are the two main gases forming the Sun.
3. Electrical energy and thermal energy	c. are the two main types of energy produced from the Sun.
	d. are the two types of energy produced from solar panels.

1. ....

2. ....

3. ....

**3 Put (✓) or (X) :**

- 1. Plants need water only to grow. ( )
- 2. Plants can grow if they are placed in dark areas for several weeks. ( )
- 3. The Sun does not have a solid surface. ( )
- 4. Hydrogen and helium gases react with each other in the Sun at very low temperatures. ( )
- 5. Looking directly at the Sun is very dangerous. ( )
- 6. Placing large windows on the walls that face the Sun helps in warming houses. ( )
- 7. A solar panel consists of one small solar cell. ( )

**4 Correct the underlined words :**

- 1. In the absence of the light of moon, plants cannot grow. (.....)
- 2. Thermal energy and sound energy are produced from the Sun and reach the Earth. (.....)
- 3. Earth is a star that is made up of gases. (.....)
- 4. Hydrogen and oxygen gases react with each other in the Sun at very high temperatures. (.....)
- 5. Small solar panels are used to supply one light bulb with sound energy. (.....)

**5 Write the scientific term of each of the following :**

- 1. The gas layer at the Sun's surface where the light we see is emitted. (.....)
- 2. Huge bodies in the space made mostly of hydrogen and helium gases. (.....)
- 3. A type of mirrors that is used to collect and focus sunlight onto metal pots to heat them and cook the food inside. (.....)
- 4. A panel designed to absorb the Sun to produce heat or generate electricity. (.....)



**6 Complete the following sentences :**

- 1. The Sun is necessary for the growth of ..... which is eaten by animals.
- 2. The Sun is a star which is mostly made up of ..... gas and ..... gas.
- 3. Among the differences between the Sun and the moon is that the Sun doesn't have a ..... surface, but it has a layer of gas which is called .....
- 4. The reaction between hydrogen and helium gases at very high temperature in the Sun produces large amounts of ..... energy and ..... energy.
- 5. The solar energy is produced from the ..... , and the ..... energy is a type of this energy which is carried by Sun rays.
- 6. When we expose our bodies to the Sun we feel .....
- 7. We can use solar energy in cooking by using curved ..... which collect and focus ..... onto metal pots to heat them.
- 8. Greenhouses convert the radiant energy of the Sun rays into ..... energy that allows farmers to plant crops which grow in ..... climates.
- 9. Solar cells that convert radiant energy coming from the Sun rays into ..... energy and ..... energy.
- 10. Solar cells that are found in some calculators produce ..... energy that is used to recharge their .....
- 11. In some villages, solar panels are used to generate ..... energy that is used to operate ..... equipment.

**7 Give reasons for :**




- 1. Sunlight is very important for plants and animals.  
.....
- 2. Sometimes the Sun is not visible in the sky but you can feel its warmth.  
.....
- 3. Some electrical devices have solar panels which are composed of many solar cells.  
.....

**8 What happens if ... ?**

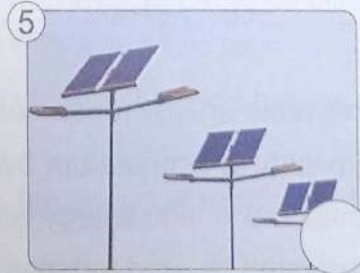
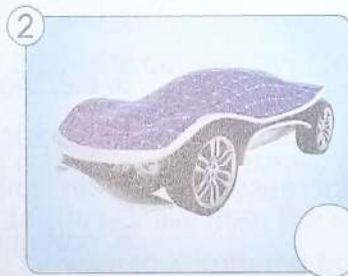
- 1. Hydrogen and helium gases react together at very high temperatures in the Sun.  
.....
- 2. You look directly at the Sun for a long time.  
.....



9 Complete the following table :

	Used energy	Produced energy
1. 	..... energy	Light energy and ..... energy
2. 	Kinetic energy	..... energy
3. 	..... energy	..... energy

10 Put (✓) in front of the pictures that can use solar energy to do its work :





## 3

**1** Choose the correct answer :

1. All the following are renewable energy resources except .....
  - a. waterfalls.
  - b. coal.
  - c. the Sun.
  - d. wind.
2. Kinetic energy created by ..... movement is used to rotate the blades of windmills.
  - a. the moon
  - b. stars
  - c. water
  - d. wind
3. When the windmill blades rotate, this causes wind turbines to rotate and generating ..... energy.
  - a. electrical
  - b. solar
  - c. chemical
  - d. potential
4. The electrical energy is transmitted from windmills to houses through .....
  - a. water.
  - b. wind.
  - c. coal.
  - d. wires.
5. The electrical energy that is transmitted to houses can operate all the following devices except .....
  - a. washing machine.
  - b. manual mixer.
  - c. electric fan.
  - d. electric heater.
6. The change of energy in an ..... is opposite to the change of energy in a wind turbine.
  - a. electric bell
  - b. electric heater
  - c. electric iron
  - d. electric fan
7. When wind ..... energy increases, the windmill blades spin more quickly.
  - a. kinetic
  - b. potential
  - c. chemical
  - d. solar

**2** Put (✓) or (X) :

1. Wind is a renewable energy resource. ( )
2. There is a similarity in temperature between cold and hot air. ( )
3. In wind turbines, the kinetic energy is converted into chemical energy. ( )
4. Electricity generated by wind turbines is transmitted through wind. ( )
5. When air blows into the wind turbine from the front, the blades spin quickly. ( )
6. When air blows into the wind turbine with a small force, the blades spin slowly. ( )



**3 Correct the underlined words :**

1. Potential energy of the wind is converted into electrical energy by wind turbines. (.....)
2. The difference in temperature between cold and hot air causes air to stop. (.....)
3. Water turbines rotate when the windmill blades rotate. (.....)
4. When air blows into the wind turbine from the side, the blades spin slowly. (.....)
5. When air blows into the wind turbine with a large force, the blades spin slower. (.....)
6. When the number of wind turbine blades increases, they spin faster. (.....)

**4 Write the scientific term of each of the following :**

- 1. A natural movement of air that is resulted from the difference in temperature between cold and hot air. (.....)
- 2. A mill that uses the power of flowing air to generate electricity. (.....)
- 3. An energy that is generated from windmills and is transmitted through wires to houses and factories. (.....)

**5 Complete the following sentences :**

- 1. Wind is formed due to the effect of ..... energy coming from the ..... in the form of rays.
- 2. The wind blows due to the difference in ..... between the cold air and the hot air.
- 3. The rotation of windmill blades is caused by ..... energy that is created by wind movement.
- 4. When the wind turbines rotate, ..... energy is converted into ..... energy.
- 5. When the wind blows into a windmills from the side, the blades rotate ..... than that when the wind blows into it from the front.
- 6. When the wind blows into a windmill with a large force, its blades rotate ..... than that when the wind blows into it with a small force.
- 7. By increasing the rotation of windmill blades, the wind turbine generates more ..... energy.
- 8. By decreasing the number of blades, the speed of rotation of turbine blades will .....
- 9. When the ..... energy of the wind increases, the speed of rotation of turbine blades will .....



## 6 Give reasons for :

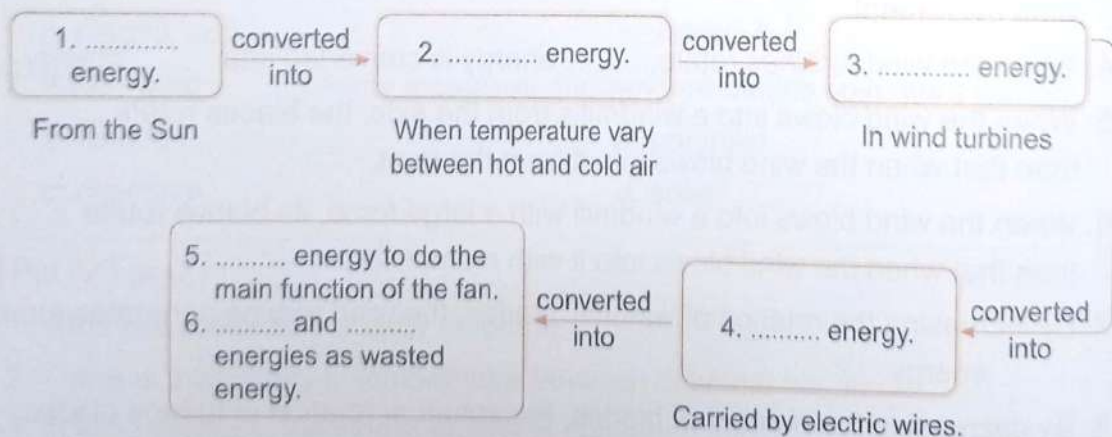
- 1. The number of windmill blades affect its efficiency.  
.....  
.....
- 2. Kinetic energy affects the speed of windmill rotation.  
.....  
.....
- 3. The direction of wind blow affects the speed of windmill rotation.  
.....  
.....

## 7 What happens if ... ?

- 1. Wind blows into the windmills from the front. (according to the speed of rotation)  
.....  
.....
- 2. The kinetic energy that is applied on the windmill increases.  
.....  
.....

## 8 Complete the following energy chain of a fan by using the words between brackets (you may use the same word more than once) :

(Thermal – Radiant – Electrical – Kinetic – Sound)





## Exercises on Lesson 4

### 1 Choose the correct answer :

- 1. Water flows through turbines in dams to generate ..... energy.
  - a. electrical
  - b. potential
  - c. solar
  - d. light
- 2. In water turbines, the ..... energy of water is changed into electrical energy.
  - a. chemical
  - b. kinetic
  - c. thermal
  - d. light
- 3. The reason of flowing of river water downhill is the ..... force.
  - a. pushing
  - b. friction
  - c. gravitational
  - d. electrical
- 4. Using of water to generate electricity depends on places .....
  - a. with strong winds.
  - b. where dams are built on rivers.
  - c. with weak winds.
  - d. where boats sail in rivers.
- 5. Both waterfalls and ..... are renewable energy resources.
  - a. wind
  - b. coal
  - c. oil
  - d. fossil fuel

### 2 Put (✓) or (X) :

- 1. Waterfalls are considered as non-renewable energy resources. ( )
- 2. Electrical energy can be generated from both waterfalls and wind movement. ( )
- 3. Dams are built on rivers to control the wind flow. ( )
- 4. The flow of water can be controlled to generate electricity in dams. ( )

### 3 Correct the underlined words :

- 1. The thermal energy generated by water turbines in dams is known as hydroelectricity. (.....)
- 2. During the flowing of rivers water downhill, the chemical potential energy of water is converted into kinetic energy. (.....)
- 3. Dams are built on rivers in order to generate solar energy. (.....)
- 4. The electrical energy is generated by wind turbines in dams. (.....)



**4 Write the scientific term of each of the following :**

- 1. A turbine that converts the energy of falling water into electrical energy. (.....)
- 2. A type of electrical energy generated by water turbines in dams. (.....)

**5 Complete the following sentences :**

- 1. When rivers flow downhill, ..... energy of water is converted into ..... energy that rotates water turbine.
- 2. People built ..... on rivers to control the water flow and increase its ..... energy that is converted into ..... energy in water turbines that is used to light houses.
- 3. Dams control the flow of ....., that causes the increase of the ..... energy of water.
- 4. The type of electrical energy which is produced by water turbines is called .....
- 5. Water and ..... are from the renewable resources of energy which use ..... energy to operate turbines and generate .....
- 6. We can use a device known as wind ..... to generate electricity in places with strong air blowing.
- 7. Water turbines are used to generate electricity in places which have waterfalls or .....

**6 Give reasons for :**

- 1. Dams are built on rivers.  
.....  
.....
- 2. Water turbines are placed in waterfalls areas.  
.....  
.....

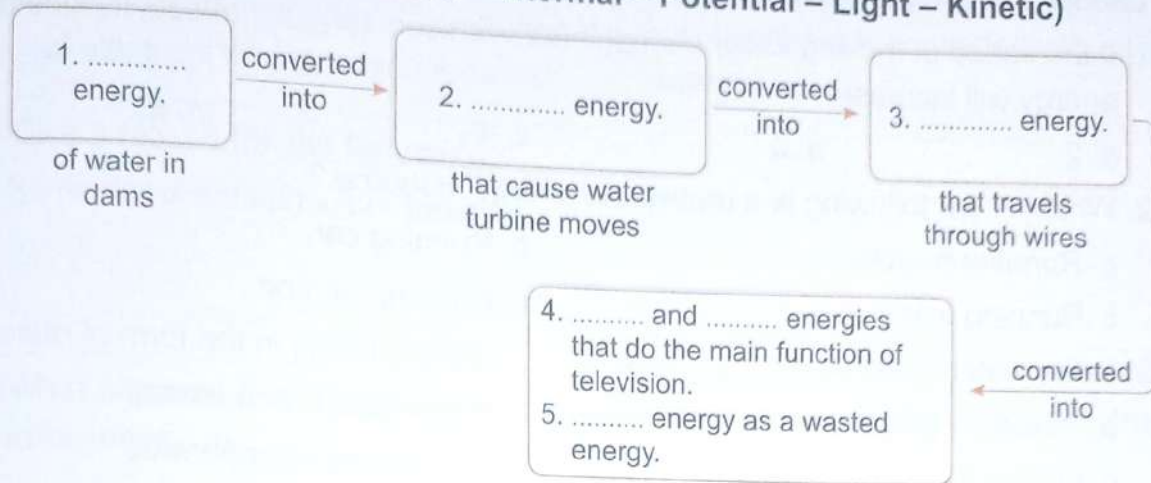
**7 What happens if ... ?**

- 1. Water turbines are placed in a dam.  
.....  
.....
- 2. Potential energy of water increased in a dam containing water turbines.  
.....



- 8 Complete the following energy chain of a television by using the words between brackets :

(Electrical – Sound – Thermal – Potential – Light – Kinetic)





## Exercises on Lessons 5 & 6

### 1 Choose the correct answer :

1. If the speed of moving water changes from 5m/sec. to ..... m/sec, its kinetic energy will increase.
  - a. 2
  - b. 3
  - c. 4
  - d. 6
2. Which of the following is a renewable energy resource ? .....
  - a. Running bicycle.
  - b. Running car.
  - c. Running water.
  - d. Running person.
3. In the water cycle, water ..... then it ..... before falling in the form of rains.
  - a. freezes – evaporates
  - b. evaporates – condenses
  - c. evaporates – freezes
  - d. condenses – evaporates
4. River water evaporates by the help of heat produced from .....
  - a. kettles.
  - b. the Sun.
  - c. electric heaters.
  - d. electric iron.
5. The form of energy resulted from waterfalls is called ..... energy.
  - a. thermal
  - b. chemical
  - c. solar
  - d. hydroelectric

### 2 Put (✓) or (X) :

1. Waterfalls are non-renewable energy resources. ( )
2. Running water in rivers has kinetic energy. ( )
3. The energy produced from wind turbines is known as hydroelectric energy. ( )
4. The evaporated water from rivers can return back to rivers in the water cycle. ( )

### 3 Write the scientific term of each of the following :

1. A turbine in which the kinetic energy of moving water is used to generate hydroelectric energy. (.....)
2. A process in which water changes into water vapour. (.....)
3. The evaporation and condensation of river water, then returning back to rivers through raining. (.....)

### 4 Complete the following sentences :

1. Renewable energy resources includes ..... , ..... and .....
2. The movement of water in river is used to rotate the water ..... to generate electricity.



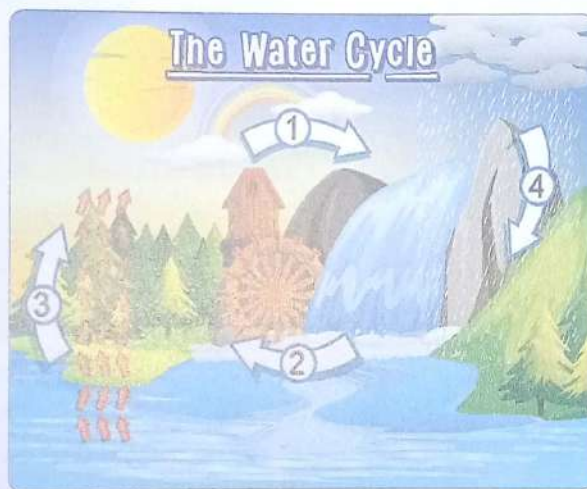
- 3. Both wind and water movement produce ..... energy that is used to rotate turbines to generate ..... energy.
- 4. Clouds are formed due to the ..... then ..... of water of rivers and seas.
- 5. In water turbines, the ..... energy of water movement is converted into a type of electrical energy which is called ..... energy.

**5 Give a reason for the following :**

- Some dams contain water turbines.

**6 What happens if water of seas and rivers evaporates then condensates in the atmospheric air.**

**7 Look at the following figure that represents the water cycle, then complete the sentences below :**

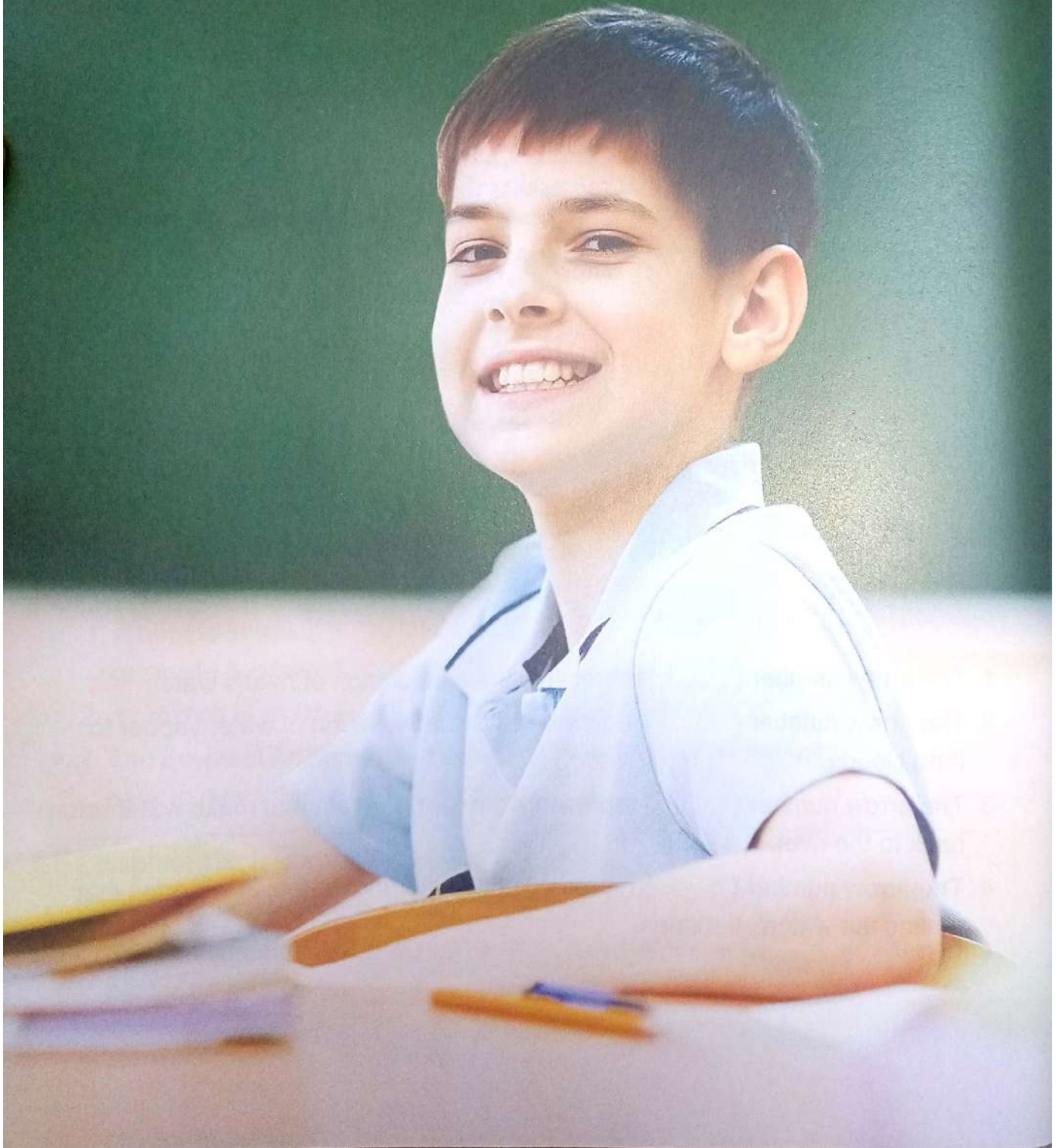


1. The arrow number ( ..... ) represents the evaporation of river's water.
2. The arrow number ( ..... ) represents the condensation of water vapour to form clouds.
3. The arrow number ( ..... ) represents the falling of rain that make water return back to the river.
4. The arrow number ( ..... ) represents the water movement in waterfall that makes the watermill rotates.



Part  
**2**

# Self-Assessments





# Self-Assessments

on concept (3.1)

## Self-Assessment 7 on Lesson 1

### 1 (A) Put (✓) or (X) :

1. The solar vehicle changes sound energy into kinetic energy. ( )
2. Mars rover curiosity can be operated from a distance. ( )
3. The stored energy in batteries is the light energy. ( )

### (B) Give a reason for the following :

Curiosity robot uses the sunlight and batteries for its operation.

### 2 (A) Write the scientific term of each of the following :

1. The main source of energy on the Earth. ( ..... )
2. The form of energy that is stored in battery of a remote controlling toy car. ( ..... )
3. The remote controlling vehicle that is used to explore the surface of Mars planet. ( ..... )

### (B) Mention two devices can be operated from a distance by using a remote control.

### 3 Look at the opposite figure, then choose the correct answer :

1. This car needs ..... to move.  
a. water                      b. wood  
c. fuel                        d. energy
2. To keep playing with the toy car when the battery runs out, we have to ..... or recharge the battery.  
a. heat                        b. cool  
c. replace                    d. freeze
3. The type of energy that is used in operating this car is ..... energy.  
a. sound                      b. light                      c. thermal                    d. electrical





## Self-Assessment 8 till Lesson 2

### 1 (A) Complete the following sentences :

1. When you rub your hands together, the consumed energy is ..... energy, while the produced energy is ..... energy.
2. The produced energy in a toy car is ..... energy, while the produced energies in a hair dryer are ..... energy and sound energy.
3. The produced energy from coal is ..... energy, that is converted into ..... energy used to operate the machines of electric power stations.

### (B) Give a reason for the following :

The thermal energy produced from burning coal is used in some electric power stations.

.....

.....

### 2 (A) Put (✓) or (X) :

1. Curiosity robot needs sound energy to be operated. ( )
2. The electric lamp is the primary source of most energies on the Earth. ( )
3. The electric iron converts electrical energy into thermal energy. ( )

### (B) What happens if ... ?

You press on the spring of the soap dispenser.

(according to the change of energy).

.....

.....

### 3 Look at the opposite figure, then complete the following sentences :

1. This living organism can convert ..... energy of the Sun into ..... energy stored inside it.
2. If the wood of this organism is burned, ..... energy is produced.
3. After death and burying of this organism over millions of years, it becomes coal that stores ..... energy.
4. The formed coal can be used in electric power stations to generate ..... energy.





## Self-Assessment 9 till Lesson 3

## 1 (A) Choose the correct answer :

- Mars rover curiosity uses ..... to be operated.
  - solar energy and electrical energy
  - solar energy and thermal energy
  - electrical energy and thermal energy
  - electrical energy and sound energy
- While playing a drum, ..... energy changes into ..... energy.
  - sound – kinetic
  - sound – light
  - kinetic – sound
  - kinetic – light
- In the bicycle, the kinetic energy is converted into ..... energy due to the friction of its tires with the road.
 

a. sound	b. thermal
c. light	d. chemical

## (B) What happens if ... ?

You rub your hands together.

(according to the change of energy).

.....

.....

## 2 (A) Correct the underlined words :

- Energy can neither be created nor destroyed, but only converted from one form to another, this is the law of consuming of energy. ( ..... )
- The consumed energy while burning some pieces of wood is the thermal energy. ( ..... )
- The lighted lamp produces chemical energy that makes you feel warmth when you put your hands near it. ( ..... )

## (B) Mention two devices that convert electrical energy into both kinetic and sound energy.

.....

.....



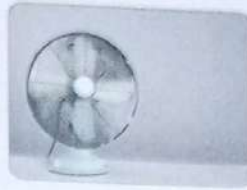
3 Look at the following figures, then complete the following sentences :



Device (1)



Device (2)



Device (3)



Device (4)

1. The electrical energy used to operate devices number ..... and .....
2. Kinetic energy is produced in devices ..... and .....

### Self-Assessment 10 till Lessons 4 & 5

1 (A) Complete the following sentences :

1. The output energy of burning coal is ..... energy, which is used to produce ..... energy in electric power stations.
2. The output energy that helps the washing machine to do its main function is ..... energy, and this energy is considered the ..... energy of the hand bell.
3. The input energy of the toy car is ..... energy that is stored in its battery and then converted into ..... energy in its wires to operate its motor.

(B) Give a reason for the following :

Sound energy and thermal energy are considered as wasted energy in the washing machine.

.....

.....

2 (A) Write the scientific term of each of the following :

1. The input energy of a television. (.....)
2. The wasted energy of a computer. (.....)
3. The output energy of the washing machine which helps it to do its main function. (.....)



(B) Mention the input and output energies of the opposite device :

1. Input energy : .....
2. Output energy : .....



3 Look at these electric devices, then complete the following sentences :



Device (1)



Device (2)



Device (3)

1. Sound and light energies are produced in the device number ..... and help it to do its function.
2. Kinetic energy is produced in devices number ..... and .....
3. Noise from devices number ..... and ..... is wasted energy, because sound doesn't help the devices functions.
4. All of these devices are operated by ..... energy that is transmitted from ..... stations through wires.



# Model Exam

on concept (3.1)

Total mark

20

## 1 (A) Choose the correct answer :

(5 marks)

1. Mars rover curiosity is designed to explore .....
  - a. Earth planet.
  - b. Mars planet.
  - c. the Sun.
  - d. the moon.
2. Plants can convert the light energy from the Sun into ..... energy which is stored inside the plant in the form of sugar.
  - a. sound
  - b. electrical
  - c. chemical
  - d. kinetic
3. When a piece of coal is burnt, ..... energy is produced.
  - a. thermal
  - b. kinetic
  - c. sound
  - d. potential
4. Inside a light bulb, electrical energy changes into ..... and ..... energies.
  - a. sound – light
  - b. sound – thermal
  - c. kinetic – light
  - d. light – thermal

## (B) What happens if you put your hands near a lighted lamp ?

.....  
.....

## 2 (A) Put (✓) or (x) :

(5 marks)

1. There is a stored chemical energy inside the food we eat. ( )
2. The input energy in a hair dryer is the chemical energy. ( )
3. As a result of friction between bike's tire and the road, kinetic energy changes into chemical energy. ( )
4. We can convert the solar energy into different forms of energy. ( )



(B) Look at the following figures, then complete the following energy chain :



Figure (1)



Figure (2)

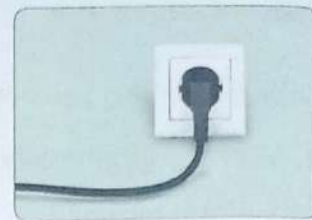


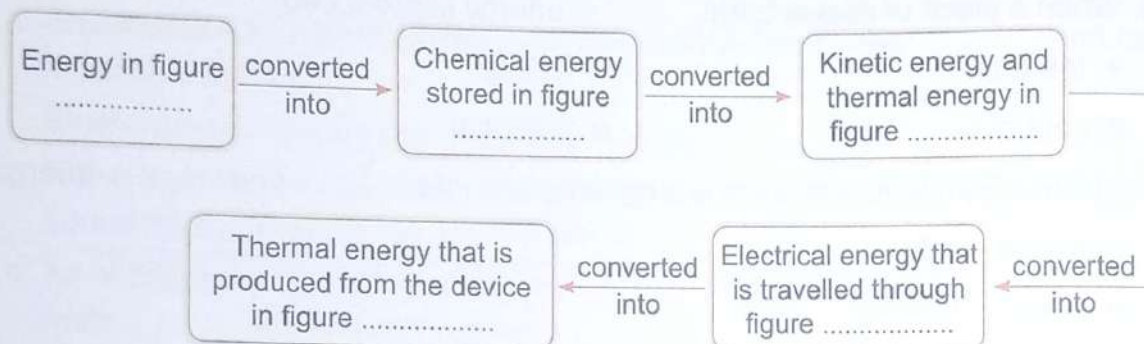
Figure (3)



Figure (4)



Figure (5)



3 (A) Correct the underlined words :

(5 marks)

1. Light energy is stored inside the battery of a mobile phone. (.....)
2. Toy cars depend on fuel as a source of electrical energy. (.....)
3. Light energy, thermal energy and chemical energy are produced when a mobile phone is used. (.....)
4. The solar energy produced from the moon can be converted into different forms of energy. (.....)

(B) Give a reason for the following :

When you press on the spring of soap dispenser, the soap moves upward.

(according to the change of energy).

.....

.....






**4 (A) Write the scientific term of each of the following :**

(5 marks)

1. The energy that is used to operate a television. (.....)
2. Energy can neither be created nor destroyed, but only converted from one form to another. (.....)
3. A kind of energy that is produced from the electric heater and burning coal. (.....)
4. The energy produced from playing guitar. (.....)

**(B) Choose from column (A) what suits it in both columns (B) and (C) :**

(A) Energy used	(B) The device	(C) Energy Produced
1. Kinetic energy	a. 	A. Thermal energy.
2. Electrical energy	b. 	B. Chemical energy.
3. Solar energy	c. 	C. Sound energy.

1. .... → .....      2. .... → .....      3. .... → .....



# Self-Assessments

on concept (3.2)

## Self-Assessment 11 on Lesson 1

### 1 (A) Choose the correct answer :

- To move a car, the fuel must be ..... at first.  
a. freezed  
b. cooled  
c. burned inside the car engine  
d. removed from the fuel tank
- During driving a car for a long distance, which of the following sentences describes the most important thing for the driver ? .....  
a. The presence of a speedometer.  
b. The presence of a radio.  
c. The fuel tank contains enough amount of gasoline.  
d. The fuel tank contains a little amount of gasoline.
- On burning fuel we obtain .....  
a. sound energy.  
b. potential energy.  
c. electrical energy.  
d. thermal energy.

### (B) Give a reason for the following :

The importance of wood and coal in our houses.

.....

### 2 (A) Put (✓) or (X) :

- Energy that is produced from burning gasoline, cannot be used to move a car. (
- Burning of all forms of fuel produces thermal energy. (
- If the fuel decreases in a car during driving, the driver must stop at the nearest fuel station to supply the car with gasoline. (

### (B) Mention three different forms of fuel.

.....

### 3 Put each of the following words in front of the suitable sentence :

[The Sun – Wood – Gasoline – Thermal energy]

- It is a form of fuel that is used in different means of transportation. (.....)
- It is a form of fuel that is used in warming houses. (.....)
- It is a form of energy which is produced from burning fuel. (.....)
- The main source of most energies on the Earth's surface. (.....)



## Self-Assessment 12 till Lesson 2

### 1 (A) Choose the correct answer :

1. Car engines can be operated by .....
  - a. coal only.
  - b. coal and wood.
  - c. gasoline only.
  - d. gasoline and natural gas.
2. The fossil fuel are formed under the Earth's surface from dead plants or animals, after a ..... period of time.
  - a. very short
  - b. short
  - c. very long
  - d. long
3. The two main types of fuel are .....
  - a. wood and coal.
  - b. water and wind.
  - c. the Sun and the moon.
  - d. fossil fuel and biofuel.

### (B) Give a reason for the following :

Biofuel is considered as a renewable fuel.

.....

### 2 (A) Put (✓) or (X) :

1. Coal can be used to produce electrical energy. ( )
2. Coal, gasoline and wood are considered as renewable resources of energy. ( )
3. The non-renewable resources of energy include coal, gasoline and water. ( )

### (B) What happens if ... ?

Marine organisms were buried under the Earth's surface over millions of years.

.....

### 3 Choose from column (B) what suits it in column (A) :

(A) Form of fuel	(B) We can get it from
1. Wood	a. wood chips and grass.
2. Gasoline and natural gas	b. cutting of trees.
3. Coal	c. decomposition of marine animals.
4. Liquid biofuel	d. decomposition of plant remains.
	e. boiling water.

1. ....

2. ....

3. ....

4. ....



## Self-Assessment 13 till Lesson 3

**1** (A) Choose the correct answer :

- (A) Choose the correct answer :
- To produce steam inside the electric power station, we have to .....
    - cool the water.
    - freeze the water.
    - heat the water.
    - cool the fuel.
  - The devices in the electric power station which operated by steam are .....
    - the generators.
    - the turbines.
    - the tubes.
    - the cables.
  - The generator inside the electric power station, turns .....
    - water into steam.
    - steam into water.
    - electrical energy into kinetic energy.
    - kinetic energy into electrical energy.

(B) What happens if ... ?

An electric generator in a power station is damaged.

2 (A) Put (✓) or (X):

1. The function of turbines in electric power station is similar to that of generators.
2. Turbines convert kinetic energy into electrical energy.
3. The electrical energy that is produced from electric power station, can be used in houses, streets and factories.

(B) Complete the following sentences by choosing the correct answer from those between brackets :

1. Fossil fuel are [non-renewable – renewable] resources of energy which are used to generate electrical energy.
2. Turbines in electric power stations are operated by the effect of [steam – sand].
3. Electrical energy travels from electric power stations to houses through [cars – cables].

**3** From your understanding of how electricity is generated in electric power stations. Put each of the following words in front of its suitable sentence :

[Coal – Steam – Turbine – Generator]

1. Its movement produces kinetic energy. (.....)
2. It changes kinetic energy into electrical energy. (.....)
3. It is a type of non-renewable resources of energy. (.....)
4. It is resulted from heating the water and it turns turbines. (.....)



## Self-Assessment 14 till Lesson 4

### 1 (A) Choose the correct answer :

- When carbon dioxide gas increases, the Earth's temperature .....
  - decreases slowly.
  - increases slowly.
  - decreases fastly.
  - doesn't change.
- All forms of fossil fuel are formed .....
  - above the Earth's surface.
  - under the Earth's surface.
  - above the water surface.
  - in the air around us.
- We have to protect stones of buildings from .....
  - global warming.
  - oxygen gas.
  - acid rain.
  - carbon dioxide gas.

### (B) Give a reason for the following :

Burning of coal and oil causes the increase of the Earth's temperature.

.....

.....

### 2 (A) Put (✓) or (X) :

- Acid rain causes global warming. ( )
- Mixing of water with oxygen gas produces carbonic acid. ( )
- Acid rains have negative effects on both soil and water of canals. ( )

### (B) What happens if ... ?

Some people live in a city that has too much cars smog.

(according to the human health).

.....

### 3 Scientists do some experiments to know the bad effects of some different sources of pollutions on different living organisms.

Match each experiment with its correct observation :

The experiment	The observation
1. Exposing a dog to cars smog for a few minutes	a. its leaves turn brown and it will die.
2. Placing a building stone in a cup contains a sample of acid rain for a long period of time	b. irritation of its eyes and lungs.
3. Watering a small plant with acid rain for a week	c. it -will decompose into small rocky particles.

1. ....

2. ....

3. ....



**Self-Assessment 15** till Lessons 5 & 6

**1** (A) Choose the correct answer :

- (A) Choose the correct answer :
1. The energy that originally causes the formation of the non-renewable fuels is .....
    - a. wind energy.
    - b. water energy.
    - c. solar energy.
    - d. electrical energy.
  2. As the time passes, the amount of coal will .....
    - a. increase.
    - b. decrease.
    - c. remain constant.
    - d. increase then decrease.
  3. Burning of fossil fuel produce .....
    - a. only gases that pollute the air.
    - b. only thermal energy.
    - c. gases that pollute the air and solar energy.
    - d. thermal energy and gases that pollute the air.

(B) Give a reason for the following :

Burning fossil fuel causes global warming phenomenon.

**2** (A) Put (✓) or (X) :

1. Renewable forms of fuel can be replaced faster than non-renewable forms of fuel.
2. Burning fossil fuel produces gases that don't cause global warming.
3. Burning coal emits gases which cause air pollution.

(B) What happens if ... ?

The amount of gases produced from burning of fossil fuel increases to very high limit. (according to Earth's temperature)

**3** Complete the following paragraph by using the following words :

[global warming – heat – raises – gases]

From disadvantages of using fossil fuel is that when it is burned, it emits ..... that cause air pollution and ..... trapping in the atmosphere, which ..... the temperature on the Earth, that causes ..... phenomenon.



# Model Exam

on concept (3.2)

Total mark

20

## 1 (A) Complete the following sentences :

(5 marks)

- Some forms of fuel can be used in cooking such as ..... and .....
- The electric generator changes ..... energy into ..... energy.
- Using the ..... resources of energy is more expensive than using fossil fuel.
- Different forms of fuel can be classified into two main types which are ..... and .....

## (B) Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Water	a. it needs extreme heat and pressure to be formed from remains of dead plants.
2. Wind energy	b. it is the main resource of energy on the Earth's surface.
3. Coal	c. it is a gaseous renewable resource of energy.
	d. it is a liquid renewable resource of energy.

1. ....

2. ....

3. ....

## 2 (A) Correct the underlined words :

(5 marks)

- Fuel is the matter that produces electrical energy on burning. (.....)
- Wood is a form of fossil fuel, that can be used in houses. (.....)
- Hydroelectrical energy, is used to produce water from waterfalls and dams. (.....)
- Gases emitted from burning fossil fuel always clear the air. (.....)

## (B) What happens if ... ?

We use renewable resources of energy instead of fossil fuel.

(according to Earth's temperature)



(5 marks)

- (B) Arrange the following steps to show how electricity is generated in electric power station and sending it to houses and factories :

- (5 marks)

- Cutting trees to obtain wood has negative effects on the environment.



# Self-Assessments

on concept (3.3)

## Self-Assessment 16 on Lesson 1

### 1 (A) Choose the correct answer :

1. The solar panels use solar energy to generate ..... energy that is used to light up lamps of light posts.  
a. thermal  
b. kinetic  
c. electrical  
d. light
2. All the following are considered as non-renewable energy resources except .....  
a. coal.  
b. watermills.  
c. natural gas.  
d. petroleum.
3. Windmill turbines generate electricity that can be used to operate all the following devices except .....  
a. television.  
b. blender.  
c. hair dryer.  
d. hand bell.

### (B) Give a reason for the following :

Modern watermills contain turbines.

.....

.....

### 2 (A) Put (✓) or (X) :

1. Electricity that is produced from watermill turbines is considered as non-renewable energy resource. ( )
2. Some toy cars are operated by batteries that are considered as renewable energy resource. ( )
3. Hundreds of years ago, people used windmills to grind grain to make flour. ( )

### (B) What happens if ... ?

The water supply that surrounds some modern watermills dries up.

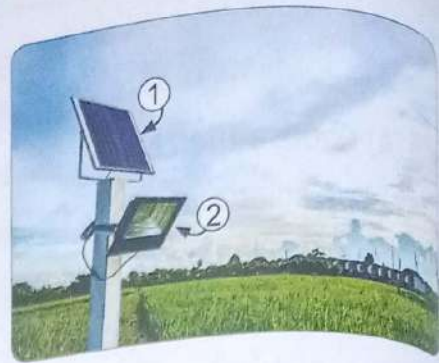
.....

.....



3 Look at the figure, then complete the following sentences :

- Device number ① represents a ..... which depends on the energy produced from the .....
- The energy used to operate a device number ① is considered a ..... energy resource.
- Device number ② produces ..... energy and ..... energy.



### Self-Assessment 17 till Lesson 2

1 (A) Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Windmills	a. generate electricity by using the kinetic energy of running water.
2. Solar panels	b. generate electricity by using sound energy.
3. Watermills	c. generate electricity by using solar energy.
	d. generate electricity by using the kinetic energy of moving air.

1. ....

2. ....

3. ....

(B) Give a reason for the following :

You shouldn't look directly at the Sun.

2 (A) Correct the underlined words :

- The stove uses natural gas which is considered as a renewable energy resource. (.....)
- We can use straight mirrors to direct sunlight onto metal pots to heat them for cooking. (.....)
- Windmill turbines convert kinetic energy into light energy. (.....)

(B) What happens if ... ?

Radiant energy that comes out of the Sun enters the greenhouses.



3 Look at the opposite picture, then complete the following sentences :

1. The name of this glass building is .....
2. The idea of working of this building depends on receiving the ..... energy from the Sun.
3. The received energy is converted into ..... energy that warms the interior of this building.
4. In the cold regions, this building allows farmers to plant crops that only grow in ..... climates.



### Self-Assessment 18 till Lesson 3

1 (A) Complete the following sentences :

1. Radiant energy is used to generate electricity directly by using ....., or indirectly as it causes ..... blowing that is used to rotate windmills.
2. A windmill spins faster by decreasing the number of its .....
3. The energy that is produced from modern wind turbines and old windmills is considered as ..... energy resource.

(B) Give a reason for :

Farmers use greenhouses to plant crops that grow in warm climates.

.....  
 .....

2 (A) Put (✓) or (X) :

1. Solar panels are used to generate sound energy in light posts. ( )
2. When the kinetic energy that is applied to the wind turbines increases, they produce more electricity. ( )
3. Both solar panels and natural gas are from renewable energy resources. ( )

(B) What happens if ... ?

The number of windmill blades increases.

.....  
 .....



- 3 If the two windmills in front of you are affected by the same wind force, Answer the following questions :



Windmill (A)



Windmill (B)

1. Which windmill spins faster ? (Give a reason for your answer).
2. Which windmill generates less electrical energy ?

### Self-Assessment 19 till Lesson 4

#### 1 (A) Choose the correct answer :

1. When the wind turbine rotates, the energy of moving air changes into ..... energy.
  - a. electrical
  - b. light
  - c. chemical
  - d. potential
2. All the following can be done by the effect of solar energy except .....
  - a. warming houses.
  - b. cooking food.
  - c. producing sound from a hand bell.
  - d. producing light from a light post.
3. Water turbines can generate more electricity by increasing the ..... energy of water that is stored in dams.
  - a. light
  - b. sound
  - c. thermal
  - d. potential

#### (B) Give a reason for the following :

Water turbines are used to generate electricity in dams.



**2 (A) Write the scientific term of each of the following :**

1. A building that is built across rivers to control the water flow and increase its potential energy. (.....)
2. A building that is used in cold areas to plant crops which grow in warm climate. (.....)
3. An energy that is produced from water turbines and is transmitted through wires to operate different devices in houses. (.....)

**(B) Mention two devices use solar energy to be operated then mention the energy transformation in each one of them.**

1. Device (1) : .....  
Changes of energy : .....
2. Device (2) : .....  
Changes of energy : .....

**3 Look at this picture that shows the High Dam that was built in Aswan many years ago, then put (✓) or (X) in front of the following questions :**

1. Stored water behind this dam has potential energy. ( )
2. The flow of water through this dam can be controlled. ( )
3. When water is released, it flows through wind turbines in the dam. ( )
4. When turbines rotate in the dam, an electrical energy is generated. ( )



**Self-Assessment 20 till Lessons 5 & 6**

**1 (A) Correct the underlined words :**

1. The energy that is produced by wind turbines is called hydroelectric energy. (.....)
2. Wind turbines produce more electricity when the wind blows from the front of its blades. (.....)
3. Greenhouses convert radiant energy that is come from the Sun into light energy that is used to plant crops which grow in warm climates. (.....)



(B) What happens if ... ?

The number of wind turbine blades decreases.

2 (A) Cross out the odd word :

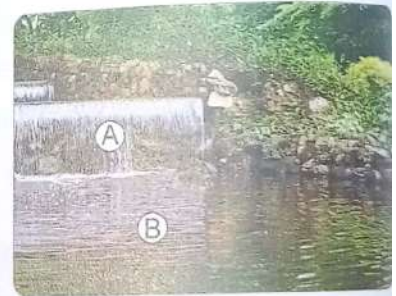
1. Water – Wind – Coal – Sun.
2. Solar car – Hand mixer – Solar panel – Greenhouse.
3. Gasoline – Coal – Natural gas – Windmill.

(B) Compare between water turbines and solar panels in the table below :

P.O.C	Water turbines	Solar panels
1. Source of energy that is used to operate it :	..... .....	..... .....
2. The produced energy :	..... energy.	..... energy and ..... energy.

3 Look at the figure, then put (✓) or (X) :

1. Water in the area (A) can be used in rotating water turbines. ( )
2. Water in the area (A) has no kinetic energy. ( )
3. Water in the area (B) may evaporate in the presence of sunlight. ( )
4. When water evaporates in both areas (A) and (B), it never return back to the river. ( )





# Model Exam

on concept (3.3)

Total mark

20

1 (A) Write the scientific term of each of the following :

(5 marks)

1. Main energy which is produced from both electric mixer and manual mixer. (.....)
2. Huge bodies in the space made mostly of hydrogen and helium gases. (.....)
3. A mill that uses the power of flowing air to generate electricity. (.....)
4. A turbine in which the kinetic energy of moving water is used to generate hydroelectricity. (.....)

(B) Give a reason for the following :

Dams are built on rivers.

.....

2 (A) Correct the underlined words :

(5 marks)

1. Thermal energy and sound energy are produced from the Sun and reach the Earth. (.....)
2. When air blows into the wind turbine with a large force, the blades spin slower. (.....)
3. Solar panels use sound energy to generate electricity. (.....)
4. During the flowing of river's water downhill, the chemical potential energy of water is converted into kinetic energy. (.....)

(B) What happens if ... ?

You look directly at the Sun.

.....

3 (A) Put (✓) or (X) :

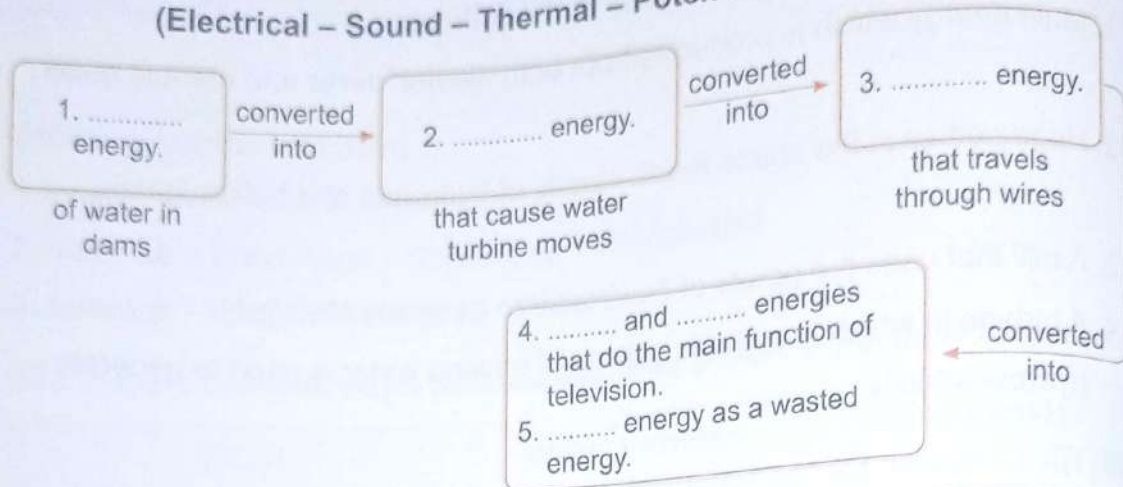
(5 marks)

1. Both wind movement and water flow has kinetic energy. ( )
2. The Sun does not have a solid surface. ( )
3. Wind is a renewable energy resource. ( )
4. The flow of water can't be controlled to generate electricity in dams. ( )



(B) Complete the following energy chain of a television by using the words between brackets :

(Electrical – Sound – Thermal – Potential – Light – Kinetic)






**4 (A) Choose the correct answer :**

(5 marks)

- In the water cycle, water ..... then it ..... before falling in the form of rains.
  - freezes – evaporates
  - evaporates – condenses
  - evaporates – freezes
  - condenses – evaporates
- The solar energy is converted into ..... energy in greenhouses.
  - electrical
  - sound
  - thermal
  - potential
- The reason of flowing of river water downhill is the ..... force.
  - pushing
  - friction
  - gravitational
  - electrical
- Some types of lamps depend on ..... as a renewable energy resource in order to do its function.
  - sunlight
  - petrol
  - coal
  - natural gas



(B) Complete the following table :

	Used energy	Produced energy
1. 	..... energy	Light energy and ..... energy
2. 	Kinetic energy	..... energy
3. 	..... energy	..... energy



# Model Exam

on Theme (3)

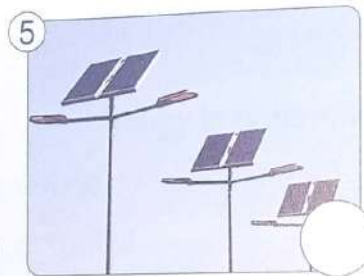
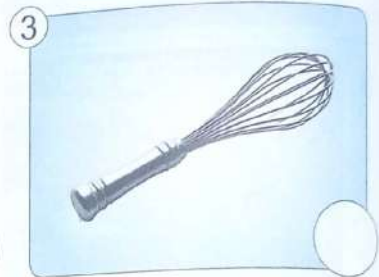
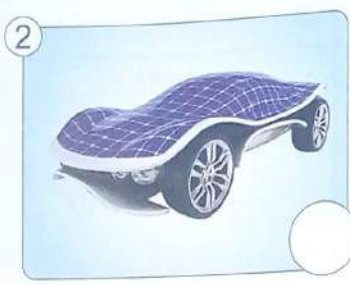
Total mark  
20

(5 marks)

## 1 (A) Complete the following sentences :

1. Remote controlled toy cars changes ..... energy stored in its batteries into ..... energy that in turn changes into ..... energy which is used to move the car.
2. When you rub your hands together, the ..... energy is converted into ..... energy.
3. Coal, ..... and ..... can be used in generating electricity.
4. Among the differences between the Sun and the moon is that the Sun doesn't have a ..... surface, but it has a layer of gas which is called .....

## (B) Put (✓) in front of the pictures that can use solar energy to do its work :



## 2 (A) Put (✓) or (X) :

(5 marks)

1. We have to reduce the usage of the Sun as a source of energy. ( )
2. As a result of global warming, the temperature on the Earth increases. ( )
3. Both wind movement and water flow has kinetic energy. ( )
4. In the soap dispenser, potential energy changes into kinetic energy. ( )

## (B) Give a reason for the following :

The importance of generators in electric power stations.

.....  
.....



### 3 (A) Write the scientific term of each of the following :

(5 marks)

1. A panel designed to absorb the Sun to produce heat or generate electricity. (.....)
2. It is any substance which produces thermal energy on burning. (.....)
3. A robotic vehicle which is designed to explore the surface of Mars. (.....)
4. The energy used to play a drum. (.....)

### (B) What happens if ... ?

Fuel runs out in a car

(according to the car movement).

### 4 (A) Correct the underlined words :

(5 marks)

1. The Moon is the primary source of both biofuel and fossil fuel. (.....)
2. Manual mixer depends on electricity to do its function. (.....)
3. After death of living organisms, their remains are buried under the Earth's surface and exposed to extreme pressure and cool. (.....)
4. Wood is one of fossil fuel that is used in warming houses. (.....)

### (B) Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Hydrogen and helium	a. are two gases involved in respiration process.
2. Light energy and thermal energy	b. are the two main gases forming the Sun.
3. Electrical energy and thermal energy	c. are the two main types of energy produced from the Sun.
	d. are the two types of energy produced from solar panels.

1. ....

2. ....

3. ....

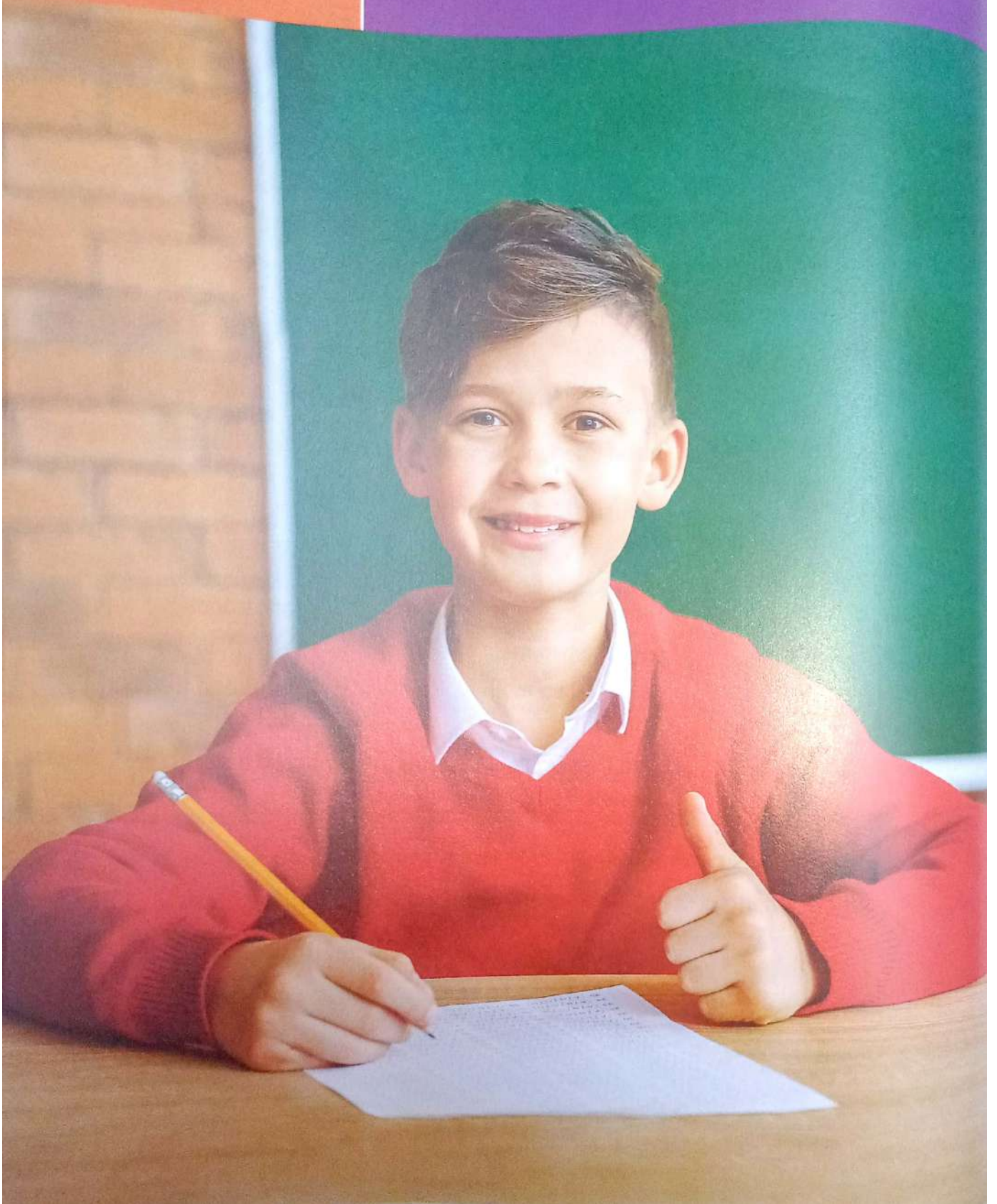


Part

3

# Final Examinations

Model Exams On The Second Term





# Model Exam (1)

## 1 Choose the correct answer :

1. Toy cars need energy to do all the following functions, except .....  
a. moving forward and backward.      b. rotation in a circle.  
c. moving right and left.                  d. rotation around the moon.
2. Collisions usually produce .....  
a. solar energy.                                  b. sound energy.  
c. gravitational potential energy.          d. chemical potential energy.
3. Among forms of fuel that present in car fuel stations are .....  
a. gasoline and wood.                          b. natural gas and coal.  
c. wood and coal.                                d. gasoline and natural gas.
4. All of the following are examples of renewable energy resources, except .....  
a. fossil fuel.      b. waterfalls.      c. wind.                  d. sunlight.
5. A very big truck needs ..... to move.  
a. very small engine                              b. small engine  
c. very big engine                                 d. no engine

## 2 Put (✓) or (X) :

1. You need gasoline to move a bicycle. ( )
2. A solar panel consists of one small solar cell. ( )
3. Most of energy chains start with the moon. ( )
4. We cannot create a new form of energy, and also we cannot destroy an existed form of energy. ( )
5. Some of kinetic energy is changed during collisions of balls in Newton's cradle into sound and thermal energies. ( )

## 3 (A) Write the scientific term for each of the following :

1. A device used to convert electrical energy into light energy. (.....)
2. Natural resources of energy, that take a short period of time to be renewed. (.....)
3. A natural movement of air that is resulted from the difference in temperature between cold and hot air. (.....)
4. The energy produced from a battery. (.....)

## (B) Give a reason for the following :

We must turn off lights that we are not needed for a while.

.....



## Model Exam (2)

**1** Choose the correct answer :

- Choose the correct answer :**
- The input energy when using the hair dryer is the ..... energy.  
a. electrical  
b. potential  
c. kinetic  
d. thermal
  - Water flows through turbines in dams to generate ..... energy.  
a. electrical  
b. potential  
c. solar  
d. light
  - Fossil fuels need ..... to be formed under the Earth's surface.  
a. five years  
b. ten years  
c. hundreds of years  
d. millions of years
  - If the angle of inclination of the road increases, the kinetic energy of an object moving downward on it, will .....  
a. decrease.  
b. increase.  
c. remain as it is.  
d. be destroyed.
  - The steps of forming fossil fuel, don't include ..... of the remains of the living organisms.  
a. decaying  
b. cooling  
c. burying  
d. heating

**2** Complete the following sentences :

1. The ..... energy changes into ..... energy when the Newton's cradle ball moves towards the rest of balls.
2. Both ..... and ..... are used to grind grains to make flour hundreds of years ago, but now we use them to generate .....
3. In any energy chain, some of the energy is lost in the form of .....
4. Wood and ..... are examples of biofuel, while ..... and ..... are examples of fossil fuel.
5. When you ride a bicycle, the ..... energy stored in your body is converted into ..... energy which cause the bicycle to move.



3 (A) Look at the following figures, then put (✓) or (x) :



car (1)



car (2)

1. The movement of the two cars can be controlled from a distance by using a remote control. ( )
2. Car (2) use sunlight to move. ( )
3. The two cars can convert the chemical energy stored in their batteries into electrical energy. ( )
4. We can use an electric cable to recharge the battery that is placed in car (1) again if it runs out. ( )

(B) What happens if ... ?

The airbags in a car don't inflate during a crash.



## Model Exam (3)

### 1 Choose the correct answer :

- When the fuel is completely consumed during the moving of a car and it stops, so all the following factors become zero, except .....  
 a. speed.                      b. kinetic energy.      c. mass.                      d. work.
- Electric wires are made of .....  
 a. copper.                      b. carbon.                      c. wood.                      d. glass.
- All the following are forms of fuel, except .....  
 a. wood.                      b. natural gas.                      c. gasoline.                      d. glass.
- The Sun is made up of gases, mainly ..... and .....  
 a. hydrogen – oxygen.                      b. helium – carbon dioxide.  
 c. oxygen – carbon dioxide.                      d. hydrogen – helium.
- When the objects collide with each other, ..... is transferred between them.  
 a. time                      b. distance                      c. energy                      d. nothing

### 2 Correct the underlined words :

- All moving objects always have a light energy. (.....)
- Curiosity is a robotic vehicle that is designed to explore the surface of moon. (.....)
- Hydroelectric energy, is one of non-renewable energy resources. (.....)
- Small solar panels are used to supply one light bulb with sound energy. (.....)
- Toy cars depend on fuel as a source of electrical energy. (.....)

### 3 (A) Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Wrecking ball	a. it is one of the safety equipment in cars, that is inflated with a gas during crashes.
2. Cricket bat	b. it changes its sound energy into light energy.
3. Seatbelt	c. it is used to hit a ball during playing.
4. Airbag	d. it is one of the safety equipment in cars, that keeps passengers in their places during crashes.
	e. it is used to hit a wall during destruction of a building.

1. .... 2. .... 3. .... 4. ....

### (B) Give a reason for the following :

The used amount of fossil fuel cannot be replaced as quickly as it is consumed.



# Model Exam (4)



## 1 Choose the correct answer :

- All the following are renewable energy resources except .....  
a. waterfalls.      b. coal.      c. the Sun.      d. wind.
- To stop the movement of an object, you can collide it with another object that has ..... from the opposite direction.  
a. much more kinetic energy      b. much more thermal energy  
c. much more light energy      d. much more sound energy
- Hydroelectric energy is generated from .....  
a. waterfalls only.      b. waterfalls and dams.  
c. biofuel only.      d. biofuel and fossil fuel.
- Both hair dryer and electrical water kettle produce ..... energy.  
a. chemical      b. thermal      c. light      d. potential
- Some electric devices need ..... energy to be recharged.  
a. electrical      b. thermal      c. potential      d. sound

## 2 Write the scientific term of each of the following :

- A process in which water changes into water vapour. (.....)
- The liquid that stores chemical energy, and it is used to move cars. (.....)
- A fuel that is produced from remains of dead animals and plants under the Earth's surface. (.....)
- It is a device that produces light from electricity. (.....)
- The wasted energy when using a mobile phone for a long time. (.....)

## 3 (A) Complete the following table :

	Used energy	Produced energy
1. 	..... energy	Light energy and ..... energy
2. 	..... energy	..... energy

## (B) What happens if ... ?

The charge of remote controlled toy car batteries is running out.

.....



## Model Exam (5)

### 1 Choose the correct answer :

1. When you use the hand bell, the ..... energy changes into sound energy.  
a. light                      b. thermal                      c. kinetic                      d. electrical
2. Using curved ..... sheets in cooking food is one of the benefits of using the solar energy.  
a. paper                      b. plastic                      c. mirror                      d. wooden
3. Collision usually include .....  
a. energy creation only.  
b. energy creation and energy destruction.  
c. energy transferring only.  
d. energy transferring and energy transformation.
4. River water evaporates by the help of heat produced from .....  
a. kettles.                      b. the Sun.  
c. electric heaters.                      d. electric iron.
5. Extreme heat and pressure under the Earth's surface has an important role in forming .....  
a. wood.                      b. wind.                      c. fossil fuel.                      d. biofuel.

### 2 Put (✓) or (X) :

1. Slower and lighter object has much kinetic energy. ( )
2. There is a stored chemical energy inside the food we eat. ( )
3. Machines make our life more easier. ( )
4. Crash investigators depend only on the information about a collision that they obtain by asking the two cars drivers. ( )
5. We have to conserve all forms of fuel. ( )

### 3 (A) Complete the following sentences :

1. When we expose our bodies to the Sun we feel .....
2. The energy can be ..... from one form to another.
3. The moment where two objects hit or make contact in a forceful way is called .....
4. By increasing the mass of a car that moves down a ramp, its kinetic energy will ..... , so the time it takes to cover the same distance will .....

### (B) Give a reason for the following :

Sunlight is very important for plants and animals.

.....

.....



## Model Exam (6)

### 1 Choose the correct answer :

1. Ancient people used ..... as a form of fuel, before discovering gasoline  
a. electricity      b. water      c. wind      d. wood
2. Oil is a non-renewable energy resource that is used inside a .....  
a. flash light.      b. car engine.      c. electric fan.      d. washing machine.
3. It takes several ..... for a spacecraft to travel from Earth to Mars.  
a. seconds      b. minutes      c. days      d. months
4. You feel warm when you rub your hands together, because ..... energy changes into thermal energy.  
a. kinetic      b. light      c. electrical      d. sound
5. When a car stops suddenly, the passengers move .....  
a. backward.      b. forward.      c. upward.      d. downward.

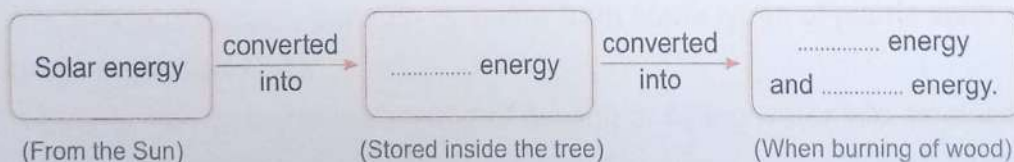
### 2 Correct the underlined words :

1. Fast and heavy object has more potential energy than a slow and light object. (.....)
2. Watermill turbines generate electricity by using the energy of wind movement. (.....)
3. Earth is a star that is made of gases. (.....)
4. We need sound energy that comes from the Sun, for cooking foods and warming houses. (.....)
5. Fossil fuel include oil, coal and wood. (.....)

### 3 (A) Use the following words to complete the energy chains below. (you may use the same word more than once) :

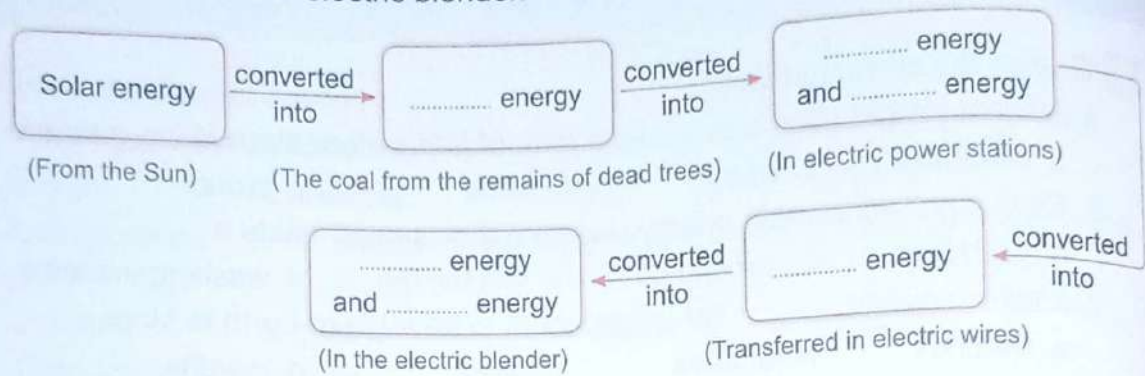
(Thermal – Chemical – Kinetic – Electrical – Sound – Light)

1. The energy chain of burning some branches of a tree :





## 2. The energy chain of electric blender.



### (B) What happens if ... ?

Two bicycles move in an opposite direction, collide with each other.

.....

.....



## Model Exam (7)

### 1 Choose the correct answer :

1. On a flat road, if a large truck is travelling at the same speed of a small car, then the truck has .....  
a. more kinetic energy.  
b. less kinetic energy.  
c. the same kinetic energy.  
d. no kinetic energy at all.
2. Sound and ..... energies are from output energies when operating the mobile phone.  
a. electrical      b. potential      c. chemical      d. light
3. We can use the energy obtained from burning of wood in all of the following situations, except .....  
a. warming houses.      b. operating television.  
c. cooking food.      d. boiling water.
4. When land and water areas on Earth absorb the solar energy, the ..... increases.  
a. temperature on Earth      b. speed of rotation of Earth  
c. speed of rotation of moon      d. speed of rotation of Sun
5. When two balls are pushed away at the left side of Newton's cradle, this happens as a result of collision of ..... at the right side.  
a. one ball      b. two balls      c. three balls      d. four balls

### 2 Write the scientific term of each of the following :

1. A type of mirrors that is used to direct sunlight onto metal utensils to heat them and cook the food inside. (.....)
2. It is a form of biofuel, that can be made from some types of plants such as grass and wood chips. (.....)
3. A turbine that converts the energy of flowing or falling water into electrical energy. (.....)
4. The energy produced from batteries. (.....)
5. It is a type of fossil fuel that is produced from dead marine animals. (.....)



**3** (A) Choose from column (B) what suits it in column (A) :

(A)	(B)
1. The mass of the object	a. affects the kinetic energy of the moving object, but doesn't affect its potential energy.
2. The height of the object from Earth's surface	b. affects both kinetic and potential energies of the object.
3. The speed of a moving object	c. when it decreases, the kinetic energy increases.
4. On Earth's surface	d. when it increases, the stored potential energy increases.
	e. the potential energy equals zero.

1. ....

2. ....

3. ....

4. ....

**(B) Give a reason for the following :**

Some calculators use the sunlight to be operated.

.....

.....



## Model Exam (8)

### 1 Choose the correct answer :

1. Some kinetic energy is converted into ..... energy due to friction of bike's tire with the road.  
a. light.                      b. electrical.                      c. potential.                      d. thermal.
2. Using water to generate electricity depends on places .....  
a. with strong winds.                      b. where dams are built on rivers.  
c. with weak winds.                      d. where boats sail in rivers.
3. Inside the electric power station, heating of ..... produce steam.  
a. turbines.                      b. generators.                      c. water.                      d. fuel.
4. Seatbelts work when the car .....  
a. decreases its speed gradually.                      b. increases its speed gradually.  
c. suddenly stops.                      d. stops gradually.
5. While playing guitar, the ..... energy changes into sound energy.  
a. kinetic.                      b. light.                      c. chemical.                      d. potential.

### 2 Complete the following sentences :

1. The wasted energies that are produced from a washing machine are ..... energy and ..... energy.
2. Dams control the flow of ....., that causes the increase of the ..... energy of water.
3. In some villages, solar panels are used to generate ..... energy that is used to operate ..... equipment.
4. Global warming is a phenomenon that raises the ..... of Earth and changes its .....
5. As a result of collision between the ball and the bat, the direction of the ball will .....

### 3 (A) Give one example for each of the following :

1. A renewable resource of energy : .....
2. A non-renewable resource of energy : .....
3. A method of conserving fossil fuel : .....
4. A disadvantage of using fossil fuel in energy production : .....

### (B) What happens if ... ?

You turn on the T.V.

(according to the change of energy)

.....  
.....



## Model Exam (9)

### 1 Choose the correct answer :

1. The output energy when playing drums is the ..... energy.  
a. chemical      b. light      c. sound      d. potential
2. Airbag is folded into all the following places in the car, except .....  
a. steering wheel.      b. dashboard.  
c. doors.      d. tires.
3. When the windmill blades rotates, this causes wind turbines to rotate and generating ..... energy.  
a. electrical      b. solar      c. chemical      d. potential
4. All the following are forms of fossil fuel, except .....  
a. water.      b. coal.      c. natural gas.      d. oil.
5. The factor that affects the kinetic energy of two objects when they move with the same speed, is .....  
a. their colors.      b. their sound energy.  
c. their masses.      d. their temperatures.

### 2 Put (✓) or (x) :

1. Energy may be destroyed inside different devices. ( )
2. When a cricket bat hits the ball, its potential energy transfers to the ball. ( )
3. Looking directly at the Sun is very dangerous. ( )
4. The movement of a generator in electric power station produces potential energy. ( )
5. The amount of oil on Earth is limited. ( )

### 3 (A) Complete the following sentences :

1. The Sun is a star which is mostly made up of ..... gas and ..... gas.
2. When a moving car hits a tree, a part of ..... energy of the car changes into a ..... energy which you hear it.
3. The change of electrical energy into sound energy in the radio is an example that proves the law of .....
4. The natural resources that can be replaced shortly after being used are called ..... resources of energy.

### (B) Give a reason for the following :

Driving fast is very dangerous.

.....  
.....



## Model Exam (10)

**1** Choose the correct answer :

1. If an object moves down along a ramp, as the angle of inclination of the ramp increases the speed of the object will .....
  - a. decrease.
  - b. increase.
  - c. not change.
  - d. become zero.
2. Which of the following is a renewable energy resources ? .....
  - a. Running bicycle.
  - b. Running car.
  - c. Running water.
  - d. Running person.
3. Curiosity rover is designed to explore .....
  - a. Earth planet.
  - b. Mars planet.
  - c. the Sun.
  - d. the moon.
4. The change of energy in an ..... is opposite to the change of energy in a wind turbine.
  - a. electric bell
  - b. electric heater
  - c. electric iron
  - d. electric fan
5. All the following factors play an important role in the formation of fossil fuel, except .....
  - a. extreme pressure.
  - b. extreme heat.
  - c. the moon light.
  - d. rocks and sediment.

**2** Write the scientific term of each of the following :

1. The matter that produces steam on heating, which is used to turn turbines in electric power station. (.....)
2. A mill that is turned by water flow. (.....)
3. A heavy steel ball that swings on a cable, and is used in destruction of parts of buildings. (.....)
4. The energy used to play a drum. (.....)
5. The process in which two objects or more crash into each other, and including an energy transfer. (.....)

**3** (A) Correct the underlined words :

1. The amount of biofuel that is consumed, cannot be replaced as quickly as it is used. (.....)
2. Dams are built on rivers in order to generate solar energy. (.....)



3. Kinetic energy of an object doesn't depend on its speed,  
which affects its potential energy (.....)
4. The moving balls of the Newton's cradle keep their kinetic energy  
as time passes. (.....)

(B) What happens if ... ?

You put your hands near the lighted lamp.

.....

.....



# Contents

Part

**1**

Guide Answer of  
Exercises on Lessons

(Page 3)

Part

**2**

Guide Answer of  
Self-Assessment

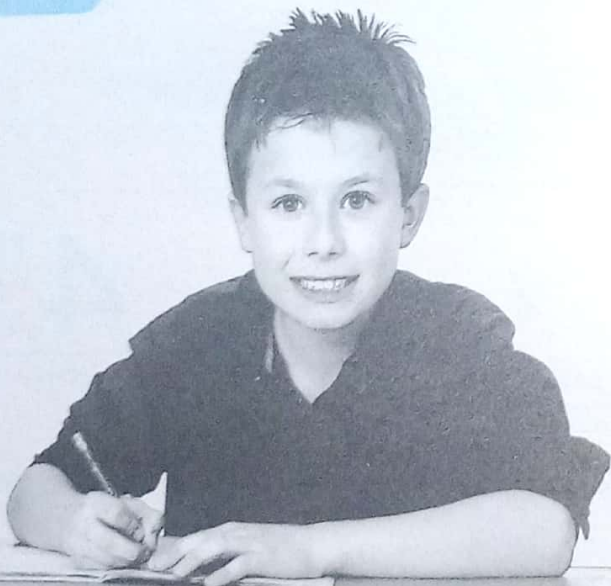
(Page 19)

Part

**3**

Guide Answers of  
Final Examinations

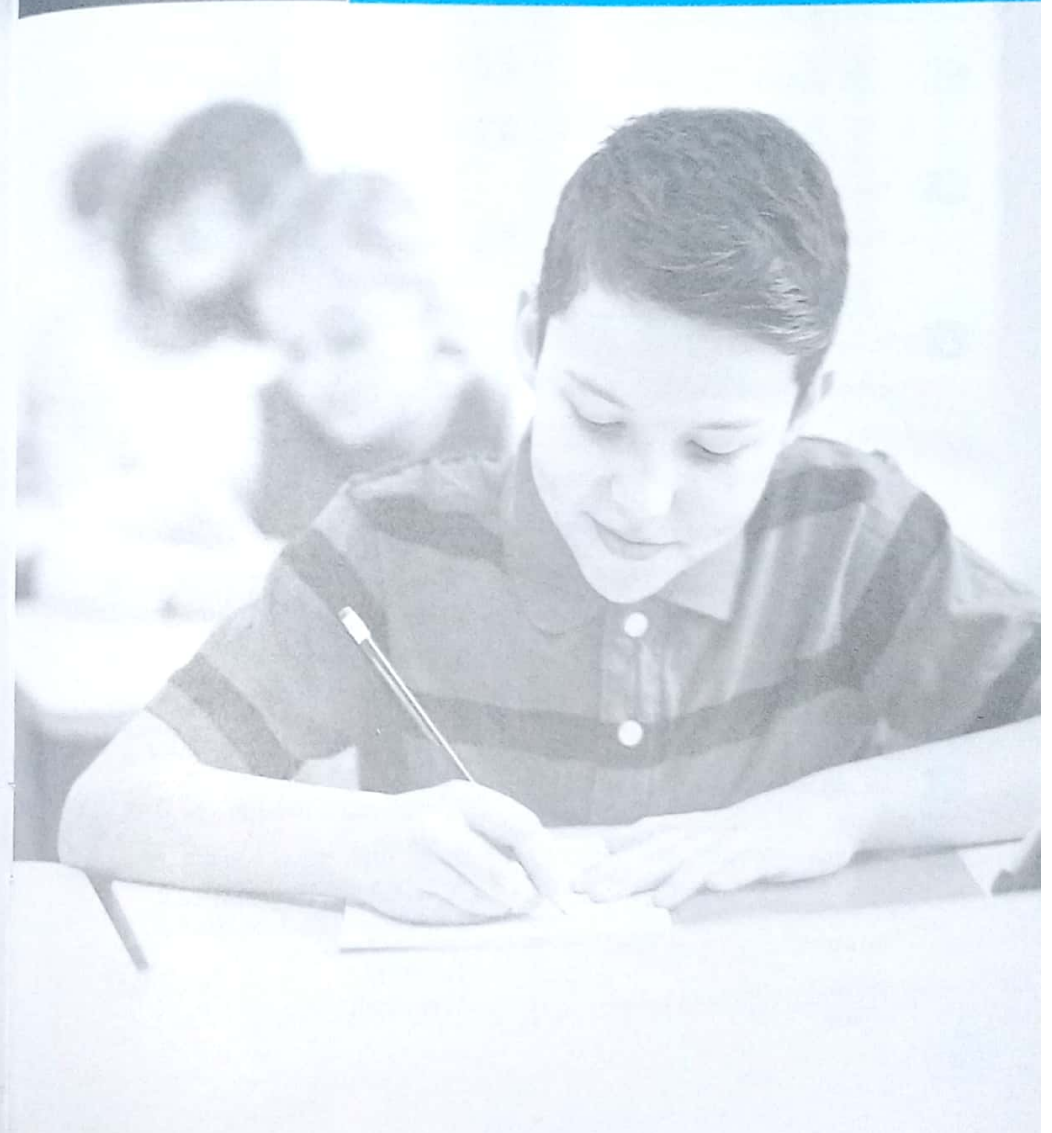
(Page 28)



Part

**1**

Guide Answers of  
Exercises on Lessons





## UNIT TWO : Matter and Energy

## Concept (2.3)

## Exercises on Lesson 6

1. 1. d 2. a 3. c  
4. b 5. d
2. 1. (✓) 2. (✗) 3. (✗) 4. (✓)  
5. (✗) 6. (✓)
3. 1. Mechanical engineers.  
2. smaller  
3. Decreasing 4. time.
4. 1. speed.  
2. gasoline – climate  
3. less  
4. distance – time – speedometer.  
5. solar – electric
5. 1. To make solar vehicles drive  
as fast as the normal vehicle.  
2. Because solar vehicle doesn't  
have speedometer.
6. It will move with less speed.
7. - The time taken =  $7 - 5$   
= 2 hours.  
- The speed of solar vehicle  
=  $\frac{\text{Distance}}{\text{Time}} = \frac{100}{2} = 50 \text{ km/hr.}$

## Concept (2.4)

## Exercises on Lesson 1

1. 1. c 2. c 3. d 4. b  
5. a 6. c 7. b 8. d
2. 1. e 2. c 3. d 4. a
3. 1. (✗) 2. (✗) 3. (✓) 4. (✗)  
5. (✓) 6. (✓)
4. 1. Wrecking ball.  
2. Seatbelt.  
3. Airbag.  
4. Vents.
5. 1. kinetic energy  
2. Wrecking ball.  
3. car  
4. changes.  
5. Airbags  
6. thin nylon  
7. kinetic energy.
6. 1. heavier  
2. kinetic – increases.  
3. seatbelts – airbags.  
4. change.  
5. airbag  
6. energy  
7. energy  
8. seatbelt

7. 1. Because the kinetic energy of  
the bat transfers to the ball.  
2. Because the seatbelts keep  
the driver's body and also  
the passengers from moving  
forward when the car stops  
suddenly.  
3. Because the airbags slow the  
speed of the driver moving  
forward and they absorb the  
energy of the car due to its  
collision.
8. 1. The kinetic energy of the bat  
transfers to the ball.  
2. The energy of collision will  
push the driver forward  
strongly that causes many  
harms to him.
9. 1. b 2. d 3. c 4. d
10. 1. The car is damaged more  
than the train. Because the  
car is slower and lighter than  
the train and the car has less  
energy.  
2. Airbags inflate automatically.
- Exercises on Lesson 2
1. 1. b 2. d 3. c 4. c  
5. a 6. c 7. b
2. 1. c 2. a 3. d
3. 1. (✗) 2. (✗) 3. (✓) 4. (✗)  
5. (✗) 6. (✗)
4. 1. Collision.  
2. Sound energy.  
3. Fuel.
5. 1. kinetic energy  
2. kinetic energy  
3. potential energy.
6. 1. collision.  
2. kinetic – sound  
3. kinetic  
4. more  
5. more  
6. light – sound
7. 1. Because a part of kinetic  
energy changes into sound  
energy.  
2. Because if the speed of the  
car increases, its kinetic  
energy increases that results  
in exerting a large force during  
an accident.
8. 1. The kinetic energy of the car  
increases.  
2. The damage would be much  
more severe.



- 9 1. The rabbit has the most kinetic energy. Because the speed of rabbit is more than that of tortoise.

2. decrease.

- 10 1. c 2. b 3. a

### Exercises on Lesson 3

- 1 1. c 2. a 3. a 4. c  
5. a 6. b 7. c 8. c

- 2 1. a 2. d 3. b

- 3 1. (x) 2. (x) 3. (✓)  
4. (x) 5. (✓)

- 4 1. double  
2. kinetic energy  
3. more  
4. kinetic energy

- 5 1. speed – kinetic  
2. more 3. decrease  
4. more  
5. more – mass – kinetic  
6. kinetic 7. less  
8. chemical – kinetic

- 6 1. Because the truck has mass more than the car.  
2. Because the car has a smaller engine than the bus.

3. Because the truck has a bigger mass, than the small car.

- 7 1. Its kinetic energy will decrease.  
2. Its kinetic energy will increase.  
3. The damage would be much more severe.  
4. The kinetic energy of the truck is more than that of the small car.

- 8 ..... car ..... truck .....  
more .....

- 9 1. d 2. b 3. c 4. d

### Exercises on Lesson 4

- 1 1. b 2. d 3. c 4. d  
5. d 6. c

- 2 1. b 2. d 3. a

- 3 1. (✓) 2. (✓) 3. (x)  
4. (x) 5. (x)

- 4 1. decreases. 2. height  
3. a large

- 5 1. increase – decrease.  
2. kinetic – angle of inclination  
3. speed – kinetic  
4. decrease.  
5. less 6. less

### Exercises on Lesson 5

- 1 1. c 2. d 3. b 4. b  
5. b 6. b 7. d

- 2 1. b 2. d 3. c

- 3 1. (x) 2. (✓) 3. (✓) 4. (x).

- 4 1. decreases 2. changes  
3. equal  
4. thermal energy

- 5 1. potential  
2. potential – kinetic  
3. kinetic  
4. kinetic – sound  
5. kinetic – thermal – friction  
6. friction – kinetic  
7. potential – kinetic  
8. kinetic – stop

- 6 1. Because some of the kinetic energy changes into sound energy during collision.  
2. Because the energy is conserved during the collision, so it cannot be destroyed.

- 7 1. It stores potential energy and doesn't have any kinetic energy.  
2. The potential energy changes into kinetic energy.  
3. Some of kinetic energy changes into thermal energy.

- 6 1. Because the car with mass 3 tons has speed and kinetic energy more than that of the car with mass 1 ton.  
2. Because the truck has mass more than that of the car, so the truck has speed and kinetic energy more than that of the car.  
3. Because the speed and kinetic energy of a toy car increase by increasing the angle of inclination of the ramp.

- 7 1. The time that taken to reach the end of ramp will decrease.  
2. The speed of the car will increase.

- 8 1. Ramp (A). Because the speed of the truck increases by increasing the angle of inclination of the ramp.  
2. The truck is faster than the car. Because the mass of the truck is more than that of the car, so the speed of the truck is more than that of the car.  
3. The speed of truck will increase.

- 9 1. (x) 2. (✓) 3. (x) 4. (✓)  
5. (x)



- 8 (1) Rise up the first ball, .....  
 (2) Potential energy of the first ball decreases .....  
 (3) Kinetic energy is transferred from the first ball .....  
 (4) Kinetic energy of all balls decreases .....

9 1. c 2. b 3. a

### Exercises on Lesson 6

1 1. c 2. d 3. b 4. b  
 5. c 6. d

2 1. (✓) 2. (✗) 3. (✓) 4. (✗)  
 5. (✓)

3 1. increases.  
 2. kinetic energy  
 3. Airbags

4 1. motion  
 2. photos – videos  
 3. motion – stops  
 4. increases.

5 1. To get more information about the crash without blocking the road.  
 2. To check their damages accurately.

6 (A) 1. Time – 100

$$2. \frac{\text{Distance}}{\text{Time}} = 120$$

(B) 1. b 2. c

7 1. Photos and videos.  
 2. The truck causes more damage than the car.

## UNIT THREE : Protecting our Planet

### Concept (3.1)

#### Exercises on Lesson 1

1 1. d 2. a 3. c  
 4. c 5. d 6. b

2 1. (✗) 2. (✓) 3. (✗)  
 4. (✓) 5. (✗) 6. (✓)

3 1. Sun 2. batteries  
 3. Mars.

4 1. Battery.  
 2. Electrical energy.  
 3. Mars rover Curiosity.

5 1. changed  
 2. chemical – electrical – kinetic  
 3. electrical 4. battery  
 5. electrical  
 6. solar – electrical

6 1. Because the chemical energy stored in battery is converted into electrical energy in turn changes into kinetic energy that makes the car moves.  
 2. Because sunlight is converted into electrical energy which calculators use it to be operated.  
 3. Due to the presence of solar panels that use sunlight to recharge its batteries.

7 1. We can recharge its batteries by connecting toy car to a nearby charger or replacing old batteries with new ones.  
 2. Solar energy is converted into electrical energy that operate them.  
 3. It cannot be operated, because it depends on sunlight to be operated.

8 1. (✓) 2. (✗) 3. (✓) 4. (✗)

#### Exercises on Lesson 2

1 1. a 2. b 3. a 4. c  
 5. d 6. a 7. d 8. c  
 9. a 10. b

2 1. (✓) 2. (✗) 3. (✗)  
 4. (✓) 5. (✓) 6. (✗)  
 7. (✓) 8. (✗) 9. (✗)  
 10. (✓)

3 1. Electrical energy.  
 2. Electrical energy.  
 3. The Sun.  
 4. Thermal energy.  
 5. Coal.  
 6. Electrical energy.  
 7. Chemical energy.



- 4** 1. electrical  
2. potential – kinetic  
3. kinetic – sound  
4. kinetic – thermal  
5. heat.  
6. light – thermal  
7. Sun

- 5** 1. Because the potential energy stored in its spring is converted into kinetic energy that moves the soap upward.  
2. Because the kinetic energy is converted into thermal energy.  
3. Because Some of the energy is lost in the form of heat.

- 6** 1. The electrical energy is converted into sound energy and light energy.  
2. The chemical energy is converted into thermal energy and light energy.  
3. The kinetic energy is converted into sound energy.

- 7** 1. Chemical – thermal – light.  
2. Chemical – thermal – kinetic – electrical – kinetic – sound.

- 8** 1.  $b \rightarrow C$       2.  $c \rightarrow A$   
3.  $a \rightarrow B$

## Exercises on Lesson 3

- 1** 1. b      2. a      3. d  
4. a      5. b      6. d

- 2** 1. (✓)    2. (✗)    3. (✓)    4. (✗)

- 3** 1. Light energy.  
2. The law of conservation of energy.  
3. Sound energy.  
4. Kinetic energy.

- 4** 1. chemical – kinetic  
2. thermal  
3. electrical – thermal  
4. conservation of energy.  
5. created – destroyed – converted

- 5** 1. Because some of the electrical energy is converted into thermal energy.  
2. Because battery is the source of energy that is used to operate the toy car.

- 6** You feel warm, because some electrical energy is converted into thermal energy.

- 7** 1. chemical – electrical  
2. electrical – light – thermal  
3. chemical – electrical – light – thermal

## Exercises on Lesson 4

- 1** 1. a      2. b      3. a      4. d  
5. c      6. b      7. a      8. c

- 2** 1. (✗)    2. (✓)    3. (✗)  
4. (✗)    5. (✓)    6. (✓)

- 3** 1. Chemical energy.  
2. Electrical energy.  
3. Thermal energy.  
4. Kinetic energy.  
5. Thermal energy.

- 4** 1. light – sound – thermal  
2. electrical – thermal – kinetic – sound  
3. sound – thermal  
4. kinetic  
5. electrical – light – thermal  
6. electrical – chemical  
7. electrical – output  
8. input – output

- 5** 1. Because it doesn't help the mobile phone do its main function.  
2. Because it is converted into kinetic, thermal and sound energies.  
3. Because they don't help the blender do its main function.

- 6** 1. Some energy is wasted as thermal energy.  
2. The electrical energy is converted into kinetic energy which do the main function of fan and sound and thermal energies as wasted energy.

- 7**  $2 \rightarrow 4 \rightarrow 1 \rightarrow 3 \rightarrow 5$

## Concept (3.2)

## Exercises on Lesson 1

- 1** 1. d      2. c      3. d  
4. c      5. b

- 2** 1. b      2. d      3. c

- 3** 1. (✗)    2. (✓)    3. (✗)  
4. (✓)    5. (✓)

- 4** 1. thermal energy  
2. Sun  
3. thermal energy

- 5** 1. The Sun.  
2. Thermal energy.  
3. Fuel.

- 6** 1. thermal – kinetic  
2. coal – natural gas – wood.  
3. oil – natural gas  
4. coal – wood



- 7** 1. Because fuel burns inside the engines to produce the thermal energy that is changed into kinetic energy which causes the different means of transportation to move.  
2. Because the fuel in the car tank runs out.  
3. To produce thermal energy which changes into kinetic energy which causes the car to move.

- 8** 1. The car fuel indicator will go down.  
2. The car movement decreases gradually until it stops.

- 9** 1. b 2. a 3. d

### Exercises on Lesson 2

- 1** 1. d 2. b 3. a 4. b  
5. d 6. a 7. b 8. c

- 2** 1. d 2. c 3. a

- 3** 1. (x) 2. (x) 3. (x) 4. (x)  
5. (x) 6. (✓) 7. (✓)

- 4** 1. a small 2. wood  
3. a long 4. The Sun  
5. plants 6. decreased.  
7. biofuel 8. Natural gas

- 5** 1. Renewable resources of energy.  
2. Non-renewable resources of energy.  
3. Liquid fuel.  
4. Fossil fuel.  
5. Coal.  
6. oil.

- 6** 1. solar energy – renewable – natural gas  
2. renewable  
3. non-renewable  
4. biofuel – fossil fuel.  
5. biofuel – charcoal.  
6. charcoal – oil – coal  
7. liquid

- 7** 1. Because they can be replaced shortly after being used.  
2. Because they are consumed at a rate faster than they can be renewed.  
3. Because continuity of cutting down trees leads to deforestation.

- 8** 1. It leads to deforestation, which causes negative effects on the environment.  
2. They are converted into fossil fuel.

3. They will form oil and natural gas.

- 9** 1. b 2. a 3. d

### Exercises on Lesson 3

- 1** 1. d 2. c 3. b 4. a  
5. d 6. b 7. c 8. b  
9. a 10. d 11. c

- 2** 1. d 2. c 3. a

- 3** 1. (✓) 2. (x) 3. (✓)  
4. (x) 5. (x) 6. (✓)

- 4** 1. natural gas. 2. heat  
3. renewable 4. steam  
5. electrical

- 5** 1. Fossil fuel. 2. Turbine.  
3. Water. 4. Generator.

- 6** 1. non-renewable  
2. renewable – waterfalls  
3. thermal  
4. kinetic – electrical  
5. steam  
6. kinetic – generators  
7. thermal – kinetic

- 7** 1. Because generators convert kinetic energy into electrical energy.  
2. To conserve the electricity.

- 8** 1. Turbine cannot produce kinetic energy, so the generator is not run and don't generate electricity.  
2. Water will not produce steam, so the turbine will not run and will not produce kinetic energy.

- 9** 1. c 2. a 3. b  
4. d 5. a

- 10** 1. (✓) 2. (x) 3. (✓) 4. (x)

- 11** (1) Fuel burns ...  
(2) Water becomes hot ...  
(3) Steam turns turbines ...  
(4) Turbines turn generator ...  
(5) Electrical energy sent to houses ...

### Exercises on Lesson 4

- 1** 1. d 2. c 3. b 4. a  
5. c 6. b 7. a

- 2** 1. b 2. c

- 3** 1. (✓) 2. (x) 3. (✓) 4. (x)  
5. (✓) 6. (x) 7. (✓)

- 4** 1. Carbonic acid.  
2. Global warming.  
3. Respiratory system.  
4. Acid rain.



- 5** 1. soil – water.  
2. air – soil – water  
3. air – eyes – lungs  
4. smog – respiratory  
5. carbon dioxide – water – carbonic  
6. carbon dioxide – air  
7. fish.  
8. carbon dioxide – global warming  
9. soil – acid
- 6** 1. Because the smog of cars cause irritation of human's eyes and lungs.  
2. Because when pesticides mix with water in canals and rivers during rain falls that lead to pollution of soil and water.  
3. Because burning of fossil fuel produces carbon dioxide gas which combines with water in air to form carbonic acid, resulting in acid rain.  
4. Because burning of coal and oil produce carbon dioxide gas which forms a layer in atmosphere that traps heat above the Earth's surface causing rise in Earth's temperature that causes global warming.

5. Because acid rain causes decomposition and dissolving of some rocks including bricks of buildings.

- 7** 1. That lead to pollution of soil and water.  
2. Decreasing the pollution of air, water and soil.  
3. Causing decomposition and dissolving of bricks of buildings.  
4. Decreasing the amount of carbon dioxide gas.

- 8** 1. c 2. b 3. c 4. b

#### Exercises on Lessons 5&6

- 1** 1. d 2. d 3. d 4. a  
5. c 6. a 7. c 8. d
- 2** 1. b 2. d 3. a
- 3** 1. (✓) 2. (✗) 3. (✗) 4. (✓)  
5. (✗) 6. (✗) 7. (✓) 8. (✓)
- 4** 1. non-renewable resources  
2. fossil fuel 3. pollute  
4. fossil fuel 5. Renewable  
6. biofuel 7. increase
- 5** 1. Fossil fuel.  
2. Global warming.

3. Renewable resources of energy.

- 6** 1. solar energy – wind energy.  
2. temperature – climate.  
3. gases – heat  
4. fossil  
5. renewable  
6. renewable – solar – wind

- 7** 1. Because fossil fuel is formed over millions of years.  
2. Because when fossil fuel is burned, it emits gases that cause air pollution.

- 8** 1. Fossil fuel will run out on the Earth.  
2. The using of renewable resources of energy will not cause an increase in the Earth's temperature.

- 9** 1. Solar energy.  
2. Coal.  
3. Walking or biking instead of driving a car.  
4. Air pollution.  
5. Not increasing the Earth's temperature.

- 10** 1. d 2. b 3. c 4. a

### Concept (3.3)

#### Exercises on Lesson 1

- 1** 1. a 2. b 3. a  
4. b 5. a 6. b
- 2** 1. (✗) 2. (✓) 3. (✗) 4. (✗)  
5. (✓) 6. (✓) 7. (✓)
- 3** 1. solar 2. water flow  
3. Electric 4. low
- 4** 1. Watermill. 2. windmill.  
3. Kinetic energy.  
4. Non-renewable energy resource.
- 5** 1. thermal – windmills  
2. blades – electrical  
3. windmills – watermills – electricity.  
4. electricity.  
5. non-renewable – renewable  
6. renewable – non-renewable
- 6** 1. Because they helped them to grind grain to make flour.  
2. Because solar cars use solar energy which is from renewable energy resources that is low in cost and always available.

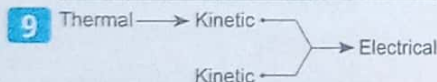


3. Because it is always available in case of presence of wind movement.

- 7** 1. Windmills don't move and also don't generate electricity.  
2. The solar energy is converted into electrical energy which causes light posts lights up.

**8**

Example	Renewable energy resource	Non-renewable energy resource
1.	—	✓
2.	✓	—
3.	—	✓
4.	✓	—

**Exercises on Lesson 2**

- 1** 1. c 2. d 3. d 4. a  
5. c 6. b 7. c 8. a
- 2** 1. b 2. c 3. d
- 3** 1. (x) 2. (x) 3. (✓) 4. (x)  
5. (✓) 6. (✓) 7. (x)

- 4** 1. the Sun 2. light  
3. Sun 4. helium  
5. electrical

- 5** 1. Photosphere. 2. Stars.  
3. Curved mirrors.  
4. Solar panel.

- 6** 1. plants  
2. hydrogen – helium  
3. hard – photosphere.  
4. light – thermal  
5. Sun – radiant  
6. warm.  
7. mirrors – sunlight  
8. thermal – warm  
9. electrical – thermal  
10. electrical – batteries.  
11. electrical – irrigation

- 7** 1. Because without sunlight plants will die, and then the animals that eat them will die also.  
2. Because the atmosphere absorbs the Sun's energy then land and water absorb this energy, which causes a rise in the Earth's temperature.  
3. To capture solar energy (especially radiant energy) coming from the Sun and converts it into electrical energy.

- 8** 1. They produce huge amounts of light and heat.  
2. Your eyes will be harmed.

**9**

	Used energy Solar	Produced energy
1.	Solar	thermal
2.		Electrical
3.	Kinetic	Electrical

- 10** ① (–) ② (✓) ③ (–)  
④ (✓) ⑤ (✓)

**Exercises on Lesson 3**

- 1** 1. b 2. d 3. a 4. d  
5. b 6. d 7. a
- 2** 1. (✓) 2. (x) 3. (x)  
4. (x) 5. (x) 6. (✓)
- 3** 1. Kinetic 2. move  
3. Wind 4. front  
5. faster 6. decreases
- 4** 1. Wind. 2. Windmill.  
3. Electrical energy.
- 5** 1. radiant – Sun  
2. temperature  
3. kinetic

4. kinetic – electrical  
5. faster 6. faster  
7. electrical  
8. increase.  
9. kinetic – increase.

- 6** 1. Because by decreasing the number of windmill blades it spins faster and generates more electricity.  
2. Because by increasing kinetic energy the blades spin faster and wind turbine generates more electricity.  
3. Because when wind blows from the side the windmill rotate faster than when wind blows from the front.

- 7** 1. The windmill rotates with high speed.  
2. Its blades spin faster and generate more electricity.

- 8** 1. Radiant  
2. Thermal  
3. Kinetic  
4. Electrical  
5. Kinetic  
6. Sound – thermal



**Exercises on Lesson 4**

- 1** 1. a      2. b      3. c  
4. b      5. a

- 2** 1. (✗)    2. (✓)    3. (✗)    4. (✓)

- 3** 1. electrical      2. gravitational  
3. electrical      4. water

- 4** 1. Water turbine.  
2. Hydroelectric energy.

- 5** 1. gravitational potential – kinetic  
2. dams – potential – electrical  
3. water – potential  
4. hydroelectric energy.  
5. wind – kinetic – electricity.  
6. turbine  
7. dams.

- 6** 1. To control the water flow and increase the potential energy of water to generate electricity.  
2. Because the flow of falling water helps water turbines rotate and generate electricity.

- 7** 1. Potential energy of water in dams is converted into kinetic energy which causes water turbines rotate and generate electricity.

2. It converts into more kinetic energy which causes water turbines spin faster and generate more electricity.

- 8** 1. Potential      2. Kinetic  
3. Electrical  
4. Light – sound  
5. Thermal

**Exercises on Lessons 5&6**

- 1** 1. d      2. c      3. b  
4. b      5. d

- 2** 1. (✗)    2. (✓)    3. (✗)    4. (✓)

- 3** 1. Water turbine.  
2. Evaporation.  
3. Water cycle.

- 4** 1. Sun – wind – water.  
2. turbines  
3. kinetic – electrical  
4. evaporation – condensation  
5. kinetic – hydroelectric

- 5** Because kinetic energy of moving water in dams is used to rotate water turbines to generate hydroelectric energy.

- 6** Clouds are formed.

- 7** 1. (3)    2. (1)    3. (4)    4. (2)

# Part 2

## Guide Answers of Self-Assessments





## Concept (2.4)

## Self-Assessment 1

- 1 (A) 1. d 2. c 3. d  
(B) To make the driver can get out of the car.

- 2 (A) 1. (✓) 2. (✓) 3. (✗)  
(B) The airbags will inflate and fill with a gas.

- 3 ..... kinetic ..... different .....  
bicycle ..... car.

## Self-Assessment 2

- 1 (A) 1. b 2. a 3. c  
(B) Because the speed of the rabbit is more than that of tortoise.

- 2 (A) 1. (✗) 2. (✗) 3. (✓)  
(B) Its kinetic energy will increase.

- 3 1. c 2. b 3. c 4. b

## Self-Assessment 3

- 1 (A) 1. c 2. c 3. d  
(B) Because the vehicle with the large mass has kinetic energy more than that of the vehicle with the small mass, so it causes more damage.

- 2 (A) 1. (✗) 2. (✓) 3. (✓)  
(B) Its kinetic energy will increase.

- 3 1. b 2. a 3. c

## Self-Assessment 4

- 1 (A) 1. d 2. a 3. c  
(B) Because the speed of the object that moves down a ramp increases by increasing the angle of inclination of the ramp.

- 2 (A) 1. (✗) 2. (✓) 3. (✓)  
(B) Its kinetic energy will increase.

- 3 1. b 2. d 3. a 4. b

## Self-Assessment 5

- 1 (A) 1. c 2. d 3. c  
(B) Because some of kinetic energy of balls changes into sound energy.

- 2 (A) 1. (✗) 2. (✓) 3. (✓)  
(B) Their kinetic energy will decrease gradually until they stop.

- 3 1. b 2. d

## Self-Assessment 6

- 1 (A) 1. d 2. b 3. c  
(B) Because the traffic cameras provide the crash investigators with photos and videos to get more information about the accident without blocking the road.

- 2 (A) 1. (✗) 2. (✓) 3. (✗)  
(B) 1. Take measurements from the scene of the accident.  
2. Collecting data.

- 3 The truck is the main reason that causes this accident.  
Because the speed of the truck is more than the speed of the road that shown by the traffic sign post.

## Model Exam on Concept (2.4)

- 1 (A) 1. d 2. c 3. a 4. c  
(B) Because the kinetic energy of the bat is transferred to the ball.

- 2 (A) 1. (✓) 2. (✗)  
3. (✓) 4. (✓)  
(B) The damage would be much more severe.

- 3 (A) 1. kinetic energy.  
2. height  
3. equal  
4. increases.  
(B) (1) Rise up the first ball, .....  
(2) Potential energy of the first ball .....  
(3) Kinetic energy is transferred from the first ball .....  
(4) Kinetic energy of all balls decreases .....

- 4 (A) 1. Wrecking ball.  
2. Collision.  
3. Vents.  
4. Sound energy.  
(B) The car causes less damage.



## Concept (3.1)

## Self-Assessment 7

- 1 (A) 1. (✗) 2. (✓) 3. (✗)  
 (B) Because it contains solar panels that convert solar energy into electrical energy which is used to charge the robot's batteries.
- 2 (A) 1. The Sun.  
 2. Chemical energy.  
 3. Mars rover Curiosity.  
 (B) 1. Remot Controlled toy car.  
 2. Mars rover Curiosity.

- 3 1. d 2. c 3. d

## Self-Assessment 8

- 1 (A) 1. kinetic – thermal  
 2. kinetic – thermal  
 3. thermal – kinetic  
 (B) Because it is converted into kinetic energy which is used to operate certain equipment in electric power stations.
- 2 (A) 1. (✗) 2. (✗) 3. (✓)  
 (B) The potential energy is converted into kinetic energy that moves the soap upward.

- 3 1. solar – chemical  
 2. thermal 3. chemical  
 4. electrical

## Self-Assessment 9

- 1 (A) 1. a 2. c 3. b  
 (B) The kinetic energy is converted into thermal energy.
- 2 (A) 1. conservation  
 2. chemical 3. thermal  
 (B) 1. Blender.  
 2. Washing machine.

- 3 1. 2 – 3 – 4  
 2. 3 – 4

## Self-Assessment 10

- 1 (A) 1. thermal – kinetic  
 2. kinetic – input  
 3. chemical – electrical  
 (B) Because they don't help the washing machine do its main function.
- 2 (A) 1. Electrical energy.  
 2. Thermal energy.  
 3. Kinetic energy.  
 (B) 1. Electrical energy.  
 2. Thermal energy.
- 3 1. (2) 2. (1) – (3)  
 3. (1) – (3)  
 4. electrical – electric power

## Model Exam on Concept (3.1)

- 1 (A) 1. b 2. c 3. a 4. d  
 (B) You feel warm because some electrical energy is converted into thermal energy.
- 2 (A) 1. (✓) 2. (✗)  
 3. (✗) 4. (✓)  
 (B) 2 → 4 → 1 → 3 → 5
- 3 (A) 1. Chemical 2. batteries  
 3. sound 4. Sun  
 (B) Because the potential energy stored in its spring is converted into kinetic energy that moves the soap upward.
- 4 (A) 1. Electrical energy.  
 2. The law of conservation of energy.  
 3. Thermal energy.  
 4. Sound energy.  
 (B) 1. b → C  
 2. c → A  
 3. a → B

## Concept (3.2)

## Self-Assessment 11

- 1 (A) 1. c 2. c 3. d  
 (B) They are used as a source of thermal energy for cooking food and warming homes.

- 2 (A) 1. (✗) 2. (✓) 3. (✓)  
 (B) - Wood.  
 - Coal.  
 - Natural gas.

- 3 1. Gasoline. 2. Wood.  
 3. Thermal energy.  
 4. The Sun.

## Self-Assessment 12

- 1 (A) 1. d 2. c 3. d  
 (B) Because biofuel can be replaced shortly after use.
- 2 (A) 1. (✓) 2. (✗) 3. (✗)  
 (B) Marine organisms will be decomposed into petroleum (oil).
- 3 1. b 2. c 3. d 4. a

## Self-Assessment 13

- 1 (A) 1. c 2. b 3. d  
 (B) The electric generator cannot convert the kinetic energy into electrical energy.
- 2 (A) 1. (✗) 2. (✗) 3. (✓)  
 (B) 1. non-renewable  
 2. steam.  
 3. cables.
- 3 1. Turbine. 2. Generator.  
 3. Coal. 4. Steam.



**Self-Assessment 14**

- 1 (A) 1. b 2. b 3. c  
(B) Because burning of coal and oil produce carbon dioxide gas which forms a layer in atmosphere that traps heat above the Earth's surface causing the increase of Earth's temperature.

- 2 (A) 1. (✗) 2. (✗) 3. (✓)  
(B) People will suffer from irritation of their eyes and lungs.

- 3 1. b 2. c 3. a

**Self-Assessment 15**

- 1 (A) 1. c 2. b 3. d  
(B) Because when fossil fuel burn, they emit gases that trap heat in the atmosphere, so the temperature of the Earth increases and changes its climate.

- 2 (A) 1. (✓) 2. (✗) 3. (✓)  
(B) The Earth's temperature will increase.

- 3 ..... gases ..... heat ..... raises  
..... global warming .....

**Model Exam on Concept (3.2)**

- 1 (A) 1. wood – coal – natural gas.  
2. kinetic – electrical  
3. renewable  
4. biofuel – fossil fuel.  
(B) 1. d 2. c 3. a

- 2 (A) 1. thermal energy  
2. biofuel 3. electricity  
4. pollute  
(B) Using renewable resources will not cause an increase in Earth's temperature.

- 3 (A) 1. (✗) 2. (✓)  
3. (✓) 4. (✗)  
(B) (1) Fuel burns .....  
(2) Water becomes hot .....  
(3) Steam turns turbines .....  
(4) Turbines turn generator .....  
(5) Electrical energy sent to .....

- 4 (A) 1. b 2. d 3. c 4. d  
(B) Because the continuity of cutting trees leads to deforestation.

**Concept (3.3)****Self-Assessment 16**

- 1 (A) 1. c 2. b 3. d  
(B) To generate electricity.
- 2 (A) 1. (✗) 2. (✗) 3. (✓)  
(B) Watermills don't move, so they don't generate electricity.
- 3 1. solar panel – Sun.  
2. renewable  
3. light – thermal

**Self-Assessment 17**

- 1 (A) 1. d 2. c 3. a  
(B) Because the rays of the Sun are very strong and can harm your eyes.
- 2 (A) 1. non-renewable  
2. curved  
3. electrical  
(B) It is converted into heat that warms the interior of the greenhouses to allow farmers to plant crops that grow in warm climates.

- 3 1. greenhouse.  
2. radiant  
3. thermal  
4. warm

**Self-Assessment 18**

- 1 (A) 1. solar panels – wind  
2. blades.  
3. renewable  
(B) Because they convert radiant energy coming from the Sun into thermal energy that warms the inside of greenhouses.
- 2 (A) 1. (✗) 2. (✓) 3. (✗)  
(B) Windmill spins slower and generates less electricity.

- 3 1. Windmill (B), Because it has less number of blades than windmill (A).  
2. Windmill (A).

**Self-Assessment 19**

- 1 (A) 1. a 2. c 3. d  
(B) Because the flow of water in dams through water turbines help them rotate and generate electricity.
- 2 (A) 1. Dam. 2. Greenhouse.  
3. Hydroelectric energy.  
(B) 1. Light posts – From solar energy to electrical energy then light energy.  
2. Calculators – From solar energy to electrical energy.



- 3 1. (✓) 2. (✓) 3. (✗) 4. (✓)

### Self-Assessment 20

- 1 (A) 1. water 2. side  
3. thermal  
(B) Wind turbine spins faster and generate more electricity.

- 2 (A) 1. Coal. 2. Hand mixer.  
3. Windmill.  
(B)

P.O.C	Water turbines	Solar panels
1. Source of energy that is used to operate it :	Water	The Sun
2. The produced energy :	Electrical energy.	Electrical energy and thermal energy.

- 3 1. (✓) 2. (✗) 3. (✓) 4. (✗)

### Model Exam on Concept (3.3)

- 1 (A) 1. Kinetic energy.  
2. The stars.  
3. Windmill.  
4. Water turbine.  
(B) To control the water flow and increase the potential energy of water to generate electricity.

- 2 (A) 1. light 2. faster  
3. solar 4. gravitational  
(B) Your eyes will be harmed.

- 3 (A) 1. (✓) 2. (✓)  
3. (✓) 4. (✗)  
(B) 1. Potential  
2. Kinetic  
3. Electrical  
4. Light – sound  
5. Thermal

- 4 (A) 1. b 2. c  
3. c 4. a  
(B)

	Used energy	Produced energy
1.	Solar energy.	Light energy and thermal energy.
2.	Kinetic energy.	Electrical energy.
3.	Kinetic energy	Electrical energy.

### Model Exam on Theme (3)

- 1 (A) 1. chemical – electrical – kinetic  
2. kinetic – thermal  
3. oil – natural gas  
4. hard – photosphere.  
(B) 1. (–) 2. (✓) 3. (–)  
4. (✓) 5. (✓)

- 2 (A) 1. (✗) 2. (✓)  
3. (✓) 4. (✓)  
(B) Because generators convert kinetic energy into electrical energy.

- 3 (A) 1. Solar panel.  
2. Fuel.  
3. Mars rover Curiosity.  
4. Kinetic energy.  
(B) The car movement decreases gradually until it stops.

- 4 (A) 1. The Sun  
2. Electric  
3. heat.  
4. biofuel  
(B) 1. b 2. c 3. d



# Part 3

## Guide Answers of Final Examinations



### PART 3

### Model Exams

#### Model Exam 1

- 1 1. d 2. b 3. d  
4. a 5. c

- 2 1. (x) 2. (x) 3. (x)  
4. (✓) 5. (✓)

- 3 (A) 1. Electric bulb.  
2. Renewable resources of energy.  
3. Wind.  
4. Electrical energy.  
(B) To conserve the electricity.

#### Model Exam 2

- 1 1. a 2. a 3. d  
4. b 5. b

- 2 1. potential – kinetic  
2. windmills – watermills – electricity.  
3. heat.  
4. charcoal – oil – coal  
5. chemical – kinetic

- 3 (A) 1. (✓) 2. (x)  
3. (✓) 4. (x)  
(B) The energy of collision will push the driver forward strongly that causes many harms to him.

#### Model Exam 3

- 1 1. c 2. a 3. d  
4. d 5. c

- 2 1. kinetic energy.  
2. Mars.  
3. renewable  
4. electrical  
5. batteries

- 3 (A) 1. e 2. c  
3. d 4. a  
(B) Because fossil fuel is formed over millions of years.

#### Model Exam 4

- 1 1. b 2. a 3. b  
4. b 5. a

- 2 1. Evaporation.  
2. Gasoline.  
3. Fossil fuel.  
4. Electric bulb.  
5. Thermal energy.

- 3 (A) 1. Solar – thermal  
2. Kinetic – Electrical  
(B) We can recharge its batteries by connecting toy car to a nearby charger or replacing old batteries with new ones.



**Model Exam 5**

- 1** 1. c      2. c      3. d  
4. b      5. c
- 2** 1. (x)      2. (✓)      3. (✓)  
4. (x)      5. (✓)
- 3** (A) 1. warm.  
2. changed  
3. collision.  
4. increase – decrease.  
(B) Because without sunlight plants will die, and then the animals that eat them will die also.

**Model Exam 6**

- 1** 1. d      2. b      3. d  
4. a      5. b
- 2** 1. kinetic  
2. water flow.  
3. Sun  
4. solar  
5. natural gas.
- 3** (A) 1. Chemical – Thermal – light  
2. Chemical – Thermal – Kinetic – Electric – Kinetic – Sound  
(B) The damage would be much more severe.

**Model Exam 7**

- 1** 1. a      2. d      3. b  
4. a      5. b
- 2** 1. Curved mirrors.  
2. Liquid fuel.  
3. Water turbine.  
4. Electrical energy.  
5. oil.
- 3** (A) 1. b      2. d  
3. a      4. e  
(B) Because sunlight is converted into electrical energy which calculators use it to be operated.

**Model Exam 8**

- 1** 1. d      2. b      3. c  
4. c      5. a
- 2** 1. sound – thermal  
2. water – potential  
3. electrical – irrigation  
4. temperature – climate.  
5. change.
- 3** (A) 1. The Sun.  
2. Coal.  
3. walking or biking instead of driving a car.  
4. Air pollution.  
(B) The electrical energy is converted into sound energy and light energy.

**Model Exam 9**

- 1** 1. c      2. d      3. a  
4. a      5. c
- 2** 1. (x)      2. (x)      3. (✓)  
4. (x)      5. (✓)
- 3** (A) 1. hydrogen – helium  
2. kinetic – sound  
3. conservation of energy.  
4. renewable  
(B) Because by increasing the speed of the car, its kinetic energy increases, which increases the harms if an accident occurs.

**Model Exam 10**

- 1** 1. b      2. c      3. b  
4. d      5. c
- 2** 1. Water.  
2. Watermill.  
3. Wrecking ball.  
4. Kinetic energy.  
5. Collision.
- 3** (A) 1. fossil fuel  
2. electrical  
3. height  
4. decrease  
(B) You feel warm, because some electrical energy is converted into thermal energy.